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REPORTS

OF THE

SLEEPING SICKNESS COMMISSION.

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No. I.

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1. Presence of Trypanosoma in Sleeping Sickness. By Dr. ALDO CASTELLANI.
2. Progress Report on Sleeping Sickness in Uganda. By Lieut.-Col. DAVID BRUCE, F.R.S., R.A.M.C., and Dr. DAVID NABARRO.

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VIEW OF LABORATORY, ENTEBBE. [*Frontispiece.*

1.

PRESENCE OF TRYPANOSOMA IN SLEEPING SICKNESS.

By ALDO CASTELLANI, M.D.

[Dated Entebbe, Uganda, April 5, 1903.—Received May 8, 1903.*]

On the 12th November, 1902, when examining a specimen of cerebro-spinal fluid taken by lumbar puncture during life from a well-marked case of *sleeping sickness*, I was surprised to observe a living Trypanosoma. Since that date I have made as many observations in this direction as possible, and the results are to my mind sufficiently surprising to excuse me for presenting this preliminary note.

These trypanosomes are not in large numbers, so that to find them it is necessary to draw off at least 15 c.cs. of the cerebro-spinal fluid. It is better to reject the first few c.cs. as they are apt to contain blood. When the fluid comes away clear, 10 c.cs. are collected and centrifuged for 15 minutes. At the end of this time there is found at the bottom of the tube a slight deposit of whitish sediment, and in some cases also a minute trace of blood.

The liquid above the sediment is poured off and the sediment examined under a moderately low power of the microscope. As the trypanosomes are at first fairly active they are easily detected.

The following tables represent the results of this investigation :—

* This has already been published in the 'Proceedings of the Royal Society,' vol. 71, 1903, p. 501.

Table I.—Sleeping Sickness Cases.

No.	Name.	Sex.	Age.	Date.	Stage of disease.	Microscopic appearance of sediment.	Presence of trypanosoma in cerebro-spinal fluid.	Remarks.
1	Mundo	M.	15	12/11/02	3rd	A few leucocytes, the majority of which are mononuclear. Some very rare red blood corpuscles.	Present	
2	Maoli.....	M.	18	25/11/02	3rd	Some few leucocytes and R.B.C.	Absent	
3	Aritzo.....	M.	25	7/12/02	3rd	Some leucocytes. No R.B.C.	Absent	
4	Manika	F.	10	15/12/02	3rd	A few leucocytes. Very few R.B.C.	Present	Patient died on December 18, 1902. No complications. In fluid from lat. vent. Tryp. present.
5	Ialika	F.	22	15/12/02	2nd	A few leucocytes. Very few R.B.C.	Absent	
6	Asmeni	F.	8	15/12/02	3rd	Some leucocytes and many R.B.C.	Absent	
7	Bolenti	M.	10	22/12/02	3rd	Some leucocytes. No R.B.C.	Present	In fresh preparations of blood taken from a finger the same day I found a few trypanosomes apparently similar to those found in the lumbar puncture liquid, only their movements were apparently more lively.
8	A.....	M.	20	5/1/03	3rd	Few leucocytes and some R.B.C.	Absent	
				7/1/03	..	Some leucocytes and very few R.B.C.	Absent	

Table I.—Sleeping Sickness Cases—*continued.*

No.	Name.	Sex.	Age.	Date.	Stage of disease.	Microscopic appearance of sediment.	Presence of trypanosoma in cerebro-spinal fluid.	Remarks.
9	Makassa	F.	25	25/1/03	3rd	Some leucocytes. No R.B.C.	Present	
10	Kaperi II.....	M.	14	25/1/03	2nd	A few leucocytes and very few R.B.C.	Absent	
11	Ally II	M.	30	2/2/03	3rd	Some leucocytes and R.B.C.	Absent	
12	Mocreza	M.	30	10/2/03	2nd	A few leucocytes and R.B.C.	Absent	
13	Budara	M.	22	27/2/03	2nd	Some leucocytes and very few R.B.C.	Present	
				2/3/03	..	Some leucocytes and very few R.B.C.	Present	
14	Nombi	F.	30	27/2/03	1st	Few leucocytes and R.B.C.	Absent	
				24/3/03	2nd	Some leucocytes and R.B.C.	Absent	
15	Fatoma	F.	18	27/2/03	2nd	Very scarce leucocytes and no R.B.C.	Absent	
				4/3/03	..	Few leucocytes and R.B.C.	Absent	
				26/3/03	..	Few leucocytes and R.B.C.	Absent	
				1/4/03	..	Some leucocytes and a few R.B.C.	Present	
16	Zenabu	F.	22	24/3/03	1st	No R.B.C.	Absent	
				28/3/03	1st	Some R.B.C.	Absent	
				1/4/03	1st	Some R.B.C.	Absent	

Table I.—Sleeping Sickness Cases—*continued*.

No.	Name.	Sex.	Age.	Date.	Stage of disease.	Microscopic appearance of sediment.	Presence of trypanosoma in cerebro-spinal fluid.	Remarks.
17	Benjamin	M.	20	25/3/03	2nd	..	Absent	
				28/3/03	..	Some few leucocytes and R.B.C.	Absent	
				29/3/03	..	Some few leucocytes and R.B.C.	Absent	
18	Zakibu	M.	25	25/3/03	2nd	Few leucocytes and R.B.C.	Present	
				27/3/03	2nd	Few leucocytes and R.B.C.	Present	
19	Seera	M.	25	26/3/03	2nd	..	Present	
20	Kimbra	M.	55	26/3/03	3rd	Some leucocytes. No R.B.C.	Present	
21	Abdulla	M.	..	26/3/03	..	No R.B.C.	Present	
22	Kagoya	F.	20	26/3/03	3rd	No R.B.C.	Present	
23	Keogaffum	M.	55	27/3/03	2nd	Some leucocytes. No R.B.C.	Absent	
				1/4/03		..	Absent	
24	Jacobo	M.	20	28/3/03	3rd	Some leucocytes. No R.B.C.	Present	The trypanosomes were much more numerous than in other cases.
25	Iegobaza	M.	40	27/3/03	2nd	Few leucocytes. No R.B.C.	Present	
26	Ibsarara.....	F.	35	27/3/03	3rd	Some leucocytes. No R.B.C.	Present	
27	Leobeni	M.	25	28/3/03	2nd	No R.B.C.	Present	
28	Kidorme	M.	20	28/3/03	2nd	Some leucocytes and R.B.C.	Present	

Table I.—Sleeping Sickness Cases—*continued.*

No.	Name.	Sex.	Age.	Date.	Stage of disease.	Microscopic appearance of sediment.	Presence of trypanosoma in cerebro-spinal fluid.	Remarks.
29	Keagabidoia.....	M.	55	28/3/03	3rd	Some leucocytes and R.B.C.	Absent	
				1/4/03	3rd	Some leucocytes and R.B.C.	Absent	
30	Kitaroma.....	M.	25	28/3/03	2nd	Some leucocytes and R.B.C.	Absent	Only 5 c.c. of liquid collected.
				2/4/03	2nd	Some leucocytes and R.B.C.	Absent	
31	Waiswa	M.	10	29/3/03	2nd	Some leucocytes and R.B.C.	Present	
32	Kaperi I.	M.	8	23/3/03	3rd	No R.B.C.	Present	Trypanosoma present also in the fluid taken from lateral vent. at the *post mortem*.
33	Matasa	M.	28	29/3/03	2nd	Few leucocytes and R.B.C.	Absent	
				2/4/03	2nd	Few leucocytes and R.B.C.	Absent	
34	Decodeno	M.	25	31/3/03	2nd	Few leucocytes and R.B.C.	Present	

Table II.—Controls.

No.	Name.	Sex.	Age.	Date.	Disease.	Microscopic appearance of sediment.	Presence of trypanosoma.	Remarks.
1	Doanira	M.	35	11/1/03	Chronic nephritis	Very few leucocytes and R.B.C.	Absent	
2	Kano Buringo	M.	30	24/3/03	Trypanosoma fever	Very few leucocytes and R.B.C.	Absent	Dr. Baker found *Trypanosoma Gambiense* in blood some days ago.
3	Landu	M.	..	24/3/03	Enlargement of femoral glands	Few leucocytes. No R.B.C.	Absent	
4	Kamsuro	M.	..	28/3/03	Trypanosoma fever	Few leucocytes and R.B.C.	Absent	Dr. Baker found *Trypanosoma Gambiense* in blood the same morning.
5	Zake	M.	25	30/3/03	Cellulitis	Few leucocytes. No R.B.C.	Absent	
6	Scongo	..	..	30/3/03	Itch	Very few leucocytes and R.B.C.	Absent	
7	Pio.....	M.	12	30/3/03	..	Very few leucocytes and R.B.C.	Absent	
8	Kaperi III	M.	25	30/3/03	Itch	Very few leucocytes and R.B.C.	Absent	
9	Eliza.....	F.	18	30/3/03	Yaws	Very few leucocytes and R.B.C.	Absent	
10	Bofralour.....	M.	16	31/3/03	Pleuritis	Very few leucocytes and R.B.C.	Absent	
11	Zanabu II.....	F.	30	31/3/03	Headache	Very few leucocytes and R.B.C.	Absent	
12	Jordien Murjan ..	M.	35	31/3/03	Trypanosoma fever	Very few leucocytes and R.B.C.	Absent	Dr. Baker found *Trypanosoma Gambiense* in blood the same morning.

Table I shows that in 34 cases of sleeping sickness, the trypanosomes were found in the cerebro-spinal fluid taken by lumbar puncture during life in 20 cases, giving a rate of 70 per cent.

On two occasions I also examined in the same way fluid from the lateral ventricles and in both cases found the same parasite. In blood I found the trypanosoma once with certainty.

It may be thought that the trypanosomes are found in the cerebro-spinal fluid on account of the trace of blood which sometimes forms part of the sediment. But it will be seen from the table that in several cases there was no trace of blood.

Table II shows that in 12 cases of ordinary disease, the cerebro-spinal fluid taken during life by lumbar puncture, in no case contained trypanosoma, and it is important to note that 3 of these controls were cases of the usual trypanosoma fever, as described by Forde and Dutton, Manson and Daniels.

Here it may be remarked that trypanosoma fever is by no means uncommon among the natives in Uganda, 3 cases having been met with by Dr. Baker, one of the colonial surgeons here (Entebbe), within the last 3 weeks. I understand that Dr. Baker is publishing this most interesting observation. It must be clearly understood that these cases of trypanosoma fever bear no resemblance in their clinical features to sleeping sickness.

The trypanosoma found in the cerebro-spinal fluid of sleeping sickness does not as far as I have been able to make out differ materially in size and shape from the species one finds in the blood of trypanosoma fever, *Trypanosoma Gambiense* (Dutton), but possibly it is to be differentiated from this one, because in it, as a rule, the micro-nucleus lies nearer the extremity and the vacuole is apparently larger. Besides, its movements are not apparently so active, but this fact might be due to the effects of the centrifuge.* In case it should prove to be a new species, the trypanosoma I have described might be called from the country where I have found it first—*Trypanosoma Ugandense.*

Relation of the Trypanosoma to Sleeping Sickness.

At the *post-mortem* examination of 80 per cent. of the cases where I found during life the trypanosoma, I grew from the blood of the heart and from the liquid of the lateral ventricles the variety of streptococcus I described many months ago in my first note. Up to that time I had never found the trypanosoma, but this is easily explained by the fact that I did not use the technique I have described

* It is interesting to note also that the trypanosoma found in sleeping sickness moves always with the so-called posterior extremity in front, whereas *T. Gambiense*, according to Dutton, proceeds usually with the anterior extremity (flagellum) in front.—*July* 29, 1903.

in this note, viz., examination of a *large* quantity of liquid after long use of the centrifuge.

Influenced by my last investigations I would suggest as a working hypothesis on which to base further investigation that sleeping sickness is due to the species of trypanosoma I have found in the cerebro-spinal fluid of the patients in this disease, and that at least in the last stages there is a concomitant streptococcus infection which plays a certain part in the course of the disease.

[*August*, 1903.—The Trypanosome described in this communication has, I find, been named *Trypanosoma Castellanii* by Kruse. See "Ueber das *Trypanosoma Castellanii*, den Erreger der Schlafkrankheit der Neger."—'Sitzungsberichte der Niederrhein. Gesellsch. f. Natur-u. Heilkunde zu Bonn, 18 Mai, 1903.']

2.

PROGRESS REPORT ON SLEEPING SICKNESS IN UGANDA.

By Lieut.-Col. DAVID BRUCE, F.R.S., R.A.M.C.,
AND
DAVID NABARRO, M.D.

(*SLEEPING SICKNESS COMMISSION.*)

[Dated Entebbe, Uganda, May 29.—Received June 29, 1903.]

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The Commission arrived in Entebbe, Uganda, on March 16, 1903, and were met by Dr. Castellani, a member of the Sleeping Sickness Commission, sent out by the Royal Society in May, 1902.

Dr. Castellani informed us of the work he had done, one especially interesting observation being that he had discovered trypanosomes in the cerebro-spinal fluid in five out of fifteen cases of sleeping sickness. Dr. Castellani remained in Entebbe for three weeks after the arrival of the new Commission, and during this time he examined twenty-nine further cases for trypanosomes, with the result that 70 per cent. were found to contain these parasites. Dr. Castellani we presume has already published these results.* After his departure the Commission continued to pursue this line of work.

1. *Examination of the Cerebro-spinal Fluid of Cases of Sleeping Sickness for Trypanosomes.*

The method employed is the same as that employed by Dr. Castellani. 10 c.c. of cerebro-spinal fluid was taken by lumbar puncture. The fluid is centrifuged for a quarter of an hour, and the whole of it poured away except the little which clings to the bottom and sides of the tube. The sediment is stirred up in this and examined under a low power, 150 to 200 diameters of the microscope; Zeiss 16 mm. apochromatic objective and Nos. 8 or 12 eyepiece do well. The trypanosomes are never very numerous. In some cases one is found only after looking through several slides, in others two or three may be seen in one field.

The cerebro-spinal fluid in Sleeping Sickness cases differs slightly from that found in healthy persons. It usually has a very slight tinge of yellow due to the presence of a few red blood corpuscles, and also has more cellular elements in suspension. These cellular elements are mostly lymphocytes.

The healthy cerebro-spinal fluid on the other hand is as clear and limpid as distilled water and contains no sediment.

It may be assumed from Table 1 that every case of sleeping sickness has trypanosomes in the cerebro-spinal fluid, even in the early stages of the disease. It must be borne in mind that, as a rule, they are in small numbers, and that one examination will not always decide their presence or absence; success is very much a matter of care and patience.

* [Dr. Castellani's results are published in the preceding Report (1). From this it will be seen that Dr. Castellani had ascertained with certainty the presence of trypanosoma in the blood of one case; in another case the result of the observation was not certain. Dr. Castellani had also observed developmental forms of the parasite. See 4 (in the press).—Sec. R.S.]

Table I.—The Result of this Procedure in Forty Cases.

Date.	Name.	Sex.	Age.	Duration of case.	No. of examination.	Trypanosoma.
1903.						
May 14	Kaperi	Male	8	3rd stage	1	Present.
Mar. 26	Seera	,,	25	1st ,,	1	,,
,, 26	Budara	,,	22	2nd ,,	1	,,
,, 26	Kimbra	,,	30	2nd ,,	1	,,
,, 26	Kagoya	Female	20	3rd ,,	1	,,
,, 27	Zeboganza	Male	40	1st ,,	2	,,
,, 27	Yakubu	,,	12	2nd ,,	1	,,
,, 28	Kidorme	,,	20	2nd ,,	1	,,
,, 28	Leobeni	,,	25	3rd ,,	1	,,
,, 29	Waiswa	,,	10	1st ,,	1	,,
,, 31	Dekodemo	,,	25	3rd ,,	1	,,
Apr. 1	Fatoma	Female	18	1st ,,	2	,,
,, 6	Katola	Male	25	1st ,,	1	,,
,, 6	Esaka	,,	28	1st ,,	1	,,
,, 6	Nakaiba	Female	10	1st ,,	1	,,
,, 6	Zakibu	Male	20	2nd ,,	1	,,
,, 6	Warosansa	,,	32	2nd ,,	1	,,
,, 8	Jansi	,,	25	1st ,,	1	,,
,, 9	Feragi	,,	12	1st ,,	1	,,
,, 10	Katoola	,,	20	1st ,,	1	,,
,, 10	Donah	,,	38	1st ,,	1	,,
,, 10	Asumani	,,	25	1st ,,	2	,,
,, 10	Kainavidi	,,	20	1st ,,	1	,,
,, 10	Moosura Madunga	,,	30	1st ,,	2	,,
,, 10	Msabwa	,,	30	1st ,,	1	,,
,, 10	Adam	,,	30	2nd ,,	1	,,
,, 13	Nonbi	Female	30	1st ,,	2	,,
,, 13	Benjamini	Male	24	1st ,,	5	,,
,, 13	Kiagoffu	,,	30	1st ,,	1	,,
,, 13	Kitaroma	,,	20	1st ,,	1	,,
,, 14	Nateneri	,,	25	1st ,,	1	,,
,, 14	Mutaisa	,,	15	1st ,,	1	,,
,, 14	Erissa	,,	20	1st ,,	1	,,
,, 14	Bagwibwa	Female	18	1st ,,	1	,,
,, 14	Johana	Male	20	1st ,,	1	,,
,, 14	Mwasa	Female	18	1st ,,	1	,,
,, 14	Rukina	Male	25	2nd ,,	1	,,
,, 20	Matasa	,,	24	1st ,,	4	,,
May 4	Kiagabidoia	,,	50	1st ,,	5	,,
,, 14	Divarana	,,	14	1st ,,	1	,,

2. *Does the Trypanosoma occur in the Cerebro-spinal Fluid of Cases of Sleeping Sickness in other districts than Uganda?*

It will be seen from the work of the first Commission* that all or almost all cases of Sleeping Sickness examined in Entebbe, showed

* 3, 'Distribution of Sleeping Sickness, *Filaria perstans*, etc., in East Equatorial Africa,' by Dr. Christy; and 5, 'Sleeping Sickness in its Clinical Aspects,' by Drs. Low and Castellani (both in the press).

the presence in the blood of *Filaria perstans*, whereas cases in Kavirondo to the east of the Lake had practically no Filaria in their blood.

It might possibly turn out that every case of sleeping sickness admitted to the Entebbe Hospital from the surrounding districts, harboured the trypanosoma, while cases in Kavirondo showed none.

Dr. Wiggins who is stationed at Kisumu in Kavirondo, and is in charge of a Sleeping Sickness Hospital there, kindly undertook to examine cases for the Commission. He had been in Entebbe for a fortnight at the beginning of April, and had been most energetic in examining cases with the Commission.

The following letter gives the result of his work in Kavirondo :—

The Principal Medical Officer,
East Africa and Uganda Protectorates,
Entebbe.

Kisumu,
14.5.03.

Sir,

I have the honour to forward herewith a table of my results so far as to the presence of trypanosomes in spinal fluid. Analysed they are as follows :—

	Number examined.	Trypanosoma present.
Not Sleeping Sickness at all (controls)	5	0
Not yet diagnosed.....	4	0
Sleeping Sickness, 1st stage	25	20
„ „ 2nd „	13	13
„ „ 3rd „	7	7

which gives—

80 per cent. of 1st stage.
100 „ 2nd „
100 „ 3rd „

I have a few more patients just admitted which I have not yet examined.

It is noticeable how many more trypanosomes there are present in the cases here than in Entebbe; though in a few cases there are *very* few. Yesterday, in an undoubted case, I had to examine five slides before I found a trypanosome, so that I shall examine my negative results again.

The "diagnosis" means my own diagnosis before puncture.

I have the honour to be, Sir,
Your most obedient servant,
C. A. Wiggins,
Medical Officer.

The trypanosomes are, therefore, practically present in the cerebro-spinal fluid of all cases of Sleeping Sickness in Kavirondo, as well as in Uganda, and this, which seemed to us an important question, has been satisfactorily answered.

3. *Does the Cerebro-spinal Fluid of the General Population contain Trypanosomes?*

Naturally it is not easy to find opportunities for performing lumbar punctures among the general population.

The following table shows the result of such controls made up to the present. More will be added as they are obtained:—

Table II.

Date.	Name.	Sex.	Age.	Locality.	Trade.	Disease.	Trypanosoma.
1903.							
Mar. 24	Landu	M.	..	Hospital	Marine	Suppurating fem. glands	Absent.
„ 30	Zake	M.	25	„	Patient	Swelling under pectoralis	„
„ 30	Icongo	M.	..	„	„	..	„
„ 30	Pio	M.	12	„	„	Fracture	„
„ 30	Kapere III.....	M.	25	„	„	Itch	„
„ 30	Eliza	F.	18	„	„	Yaws.	„
„ 31	Bofralour	M.	16	„	„	Pleuritis	„
„ 31	Zanabu	F.	30	„	„	Headache	„
Apr. 1	Nabujam	F.	45	„	„	Cerebral tumour	„
„ 8	Kamsa Mahomed	M.	25	„	„	Madura foot	„
„ 23	Daudi.....	M.	..	Entebbe	Prisoner	Patient in civil hospital	„
„ 24	Nathaniel	M.	..	Hospital	Patient	Not diagnosed	„
„ 29	Arkadi	M.	..	„	„	Suppurating bubo	„
May 8	Matea.....	M.	..	„	„	Circumcision	„
„ 6	Kavera.....	M.	..	„	„	Rheumatism	„

From this table it would appear that the cerebro-spinal fluid taken by lumbar puncture during life from members of the general population not suffering from Sleeping Sickness, does not contain the trypanosoma.

4. *Does the Blood of Sleeping Sickness Cases also contain Trypanosomes?*

If the cerebro-spinal fluid contains trypanosomes, they must, one would think, get into that fluid by way of the blood, and, therefore, the blood must also contain them. In the case of the blood the presence of the corpuscles is a barrier to finding the trypanosome easily. It was thought that centrifuging the blood would drive the parasites down with the red blood corpuscles. On trial this was found not to be so. It is a curious fact that both filariæ and trypanosomes resist the centrifugal action and are most readily found after being centrifuged three or even four times. The procedure adopted was to collect 10 c.c. of blood from a vein in a test-tube containing a little citrate of

Table III.

Date.	Name.	Sex.	Age.	Duration of disease.	Trypanosoma.
1903.					
Apr. 16	Benjamini.....	Male	28	1st stage	Present.
„ 18	Esaka	„	28	1st „	„
„ 18	Waiswa	„	10	1st „	„
„ 18	Kidorme.....	„	20	2nd „	„
„ 18	Zebuganza	„	40	1st „	„
„ 18	Budara	„	22	2nd „	„
„ 20	Kimbra	„	30	2nd „	„
„ 20	Matasa.....	„	24	1st „	„
„ 21	Seera	„	25	2nd „	Absent.
„ 22	Warosansa.....	„	32	2nd „	Present.
„ 22	Katola	„	25	1st „	„
„ 27	Koagoffa.....	„	30	1st „	„
„ 27	Kitaroma	„	20	1st „	„
May 12	Nakaiba	Female	8	1st „	„
„ 12	Musa	Male	20	1st „	„
„ 14	Diwarana	„	14	1st „	„

potash solution to prevent coagulation. This was centrifuged for 10 minutes. The clear layer of plasma was now poured off and again centrifuged. This procedure was repeated four times and the sediment remaining after each centrifuging, examined microscopically.

It seemed needless to pursue this subject further, as it was evident that practically every case of Sleeping Sickness contained the trypanosome in the blood as well as in the cerebro-spinal fluid. In all probability they also could be found in the urine in some of the cases, but as little was to be gained it was not thought necessary to test this point. If the presence of the trypanosome in the blood or cerebro-spinal fluid becomes in the future a method of diagnosing this disease in doubtful cases, then it is easy to draw off 10 c.c. of either fluid.

5. *Does the Blood of the General Population contain Trypanosomes?*

On the West Coast of Africa, during the past two years, trypanosomes have been found in the blood of several persons. They have not been confined to the blood of natives, but at least three white people have been affected. No suspicion of these being cases of Sleeping Sickness has been entertained by those in medical charge of them. The symptoms are different. Trypanosome fever appears to cause little or no inconvenience to those harbouring the parasite, whereas in Sleeping Sickness the disease is a well-marked one and is invariably fatal. Can there be any connection between the two?

During the last few weeks Dr. Baker, of the Colonial Service, who is stationed here, has discovered trypanosomes in the blood of five natives, and Dr. Moffat, C.M.G., Principal Medical Officer of East Africa and Uganda Protectorates, has also found them in the blood of a European.

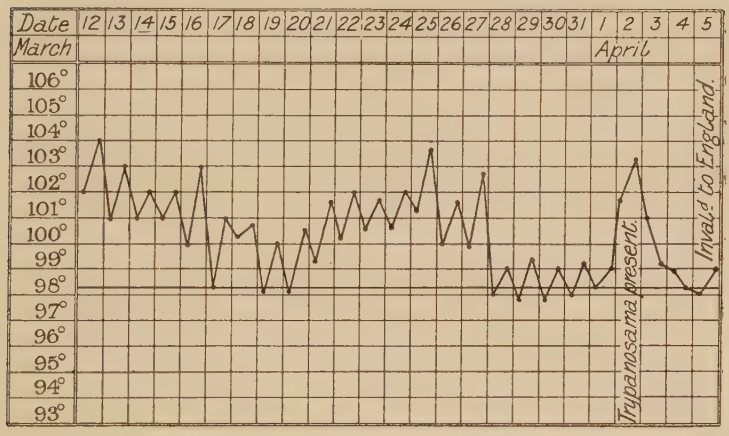
As we are face to face with a curious problem, we will, with the permission of Drs. Moffat and Baker, give a temperature chart and a short description of each of these cases. The subject, beyond its possible connection with Sleeping Sickness, is an interesting and comparatively new one.

CASE 30.—J. M. European (Male).

This case was under the care of Dr. Moffat and was treated for malaria. No malarial parasites were seen at any time, but of course the patient was under quinine. On April 2, Dr. Moffat discovered trypanosomes in the blood. It is impossible to say whether the temperature curve is due to malaria or trypanosoma. The difference between the temperature charts of the natives and the European may be a question of race.

This patient was employed in the Botanical Garden, Entebbe, which is situated on the shores of the lake and is full of tsetse flies and rank vegetation.

The following chart represents the course of the disease :—



Remarks.—This patient has been invalided to England where the case will probably be under observation.

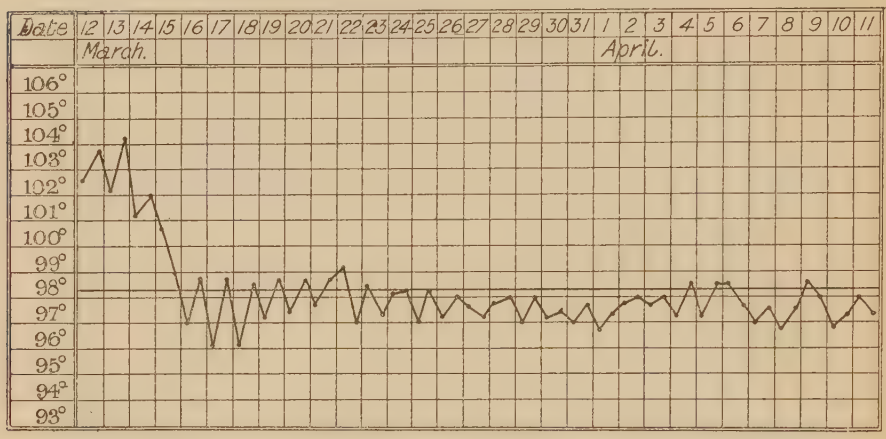
The trypanosomes from this case were short and plump (fig. 5, Plate 3), and quite different in appearance from those found in the blood of the natives.

CASE 31.—Karala Barigi (Male). Trypanosoma fever. District, Singo. Occupation, Policeman. Tribe Mundu, Nubian.

April 24. Patient has been quartered during the last 6 months in Entebbe. His illness began on March 10. He states that at present he feels quite well, and has no headache or other symptom. There are no enlarged glands in the neck; but in the axilla they are as large

as peas, and they are also enlarged in the inguinal region. His tongue is moist and furred. His speech is fluent. Pulse 120, fair. His heart sounds are normal.

The following chart represents the course of the temperature :—



May 29. The temperature has remained normal to the present date.

The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid :—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Mar. 12....			+		
,, 13....			+		
,, 14....			+		
,, 15....			+		
,, 24....					−
Apr. 17....				−	−
May 6 ...				−	−
,, 16....	+		−		
,, 19....			+		

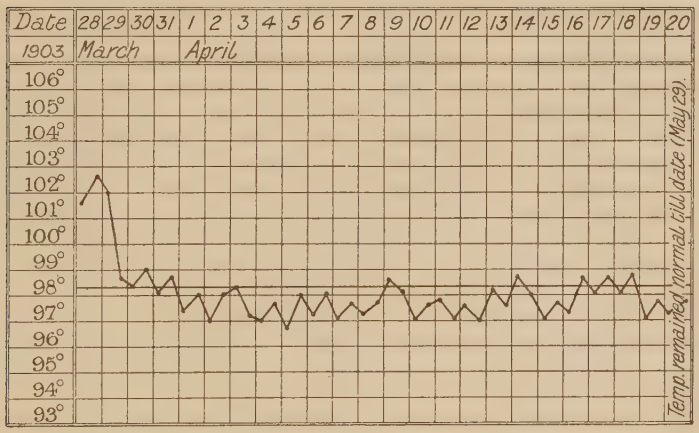
Remarks.—Here, then, we have a native with trypanosoma in his blood, and he shows no symptoms except the initial fever. The parasites were found in the blood in small numbers in ordinary microscopical preparations, without the previous use of the centrifuge.

It will be also noted that in spite of several lumbar puncturings the micro-organisms are not found in the cerebro-spinal fluid. The man is at duty and seems to be in perfect health.

CASE 63.—Kumsarsabba (Male). Age 25 years. Trypanosoma fever. District, Buddu. Occupation, Policeman.

March 28, 1903. Was admitted to hospital. He states that he has been in the force 11 months, that none of his people have had sleeping sickness, and that he has never been ill like this before. He has no œdema, walks well, the lymphatic glands in the neck are not enlarged; there is some slight enlargement in the glands of the groin. His tongue is furred. Pulse 120. Heart sounds normal. He has some tremor of hands and tongue. His speech is normal.

The following chart reports the course of the disease:—



May 29. The temperature remained normal to present date.

The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid:—

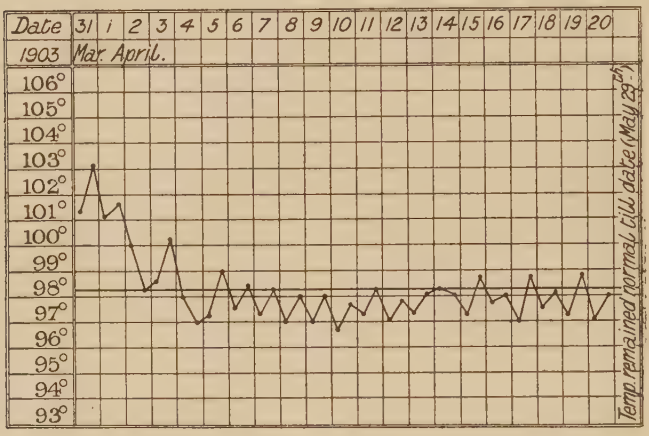
Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Mar. 26....			+		
Apr. 17....				−	−
May 7....				−	
„ 16....			−		
„ 19 ...	+		−		

Remarks.—This man is also at duty.

Case 64.—Jordien Murjan (Male). Age 35 years. Trypanosoma fever. District, Muru, Nubian. Occupation, prisoner, for last 2 years.

March 31, 1903. Admitted to hospital. He is an old Soudanese mutineer and lives in the jail. No fellow prisoners have had Sleeping Sickness. He has no œdema, and no noticeable swelling of glands. His tongue is healthy, but shaky. There is no tremor of the hands. His speech is normal and pulse 144.

The following chart represents the course of the disease :—



The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid :—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Mar. 31....			+		—
Apr. 1....			+		
,, 2....			+		
,, 3....			+		
,, 17....				—	—
May 1....	—	—	+		—
,, 11....			+		—
,, 25....			+		—

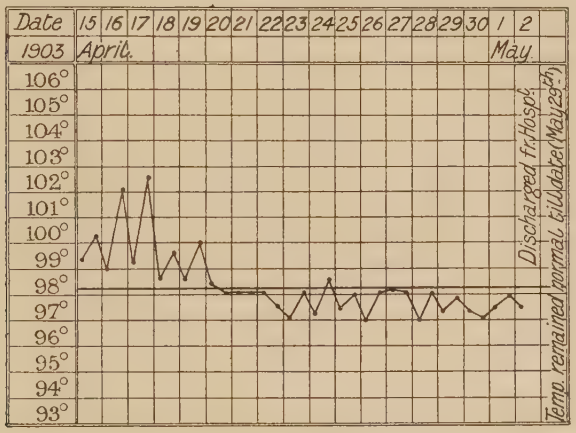
This man has been repeatedly examined by lumbar puncture with negative results.

Case 66.—Tabula (Male). Age 25. Trypanosoma fever. District, Marine Village, Entebbe. Occupation, Marine.

April 15, 1903. Admitted to hospital. He states that he has been in the service one year. He has never had this disease before. There are no sleeping sickness cases in the marine village.

April 24. Patient complains of a slight headache to-day. His pulse is 96, his heart is normal. The glands at the back of his neck are slightly enlarged, as are also those of the inguinal region. His speech is normal, he sleeps well, and his tongue is moist and clean. He has no tremors.

The following chart represents the course of the disease:—



The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid :—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Apr. 15....	−	−	+		−
„ 17....				+	−
May 6 ...				−	−
„ 20....	+		+	−	−

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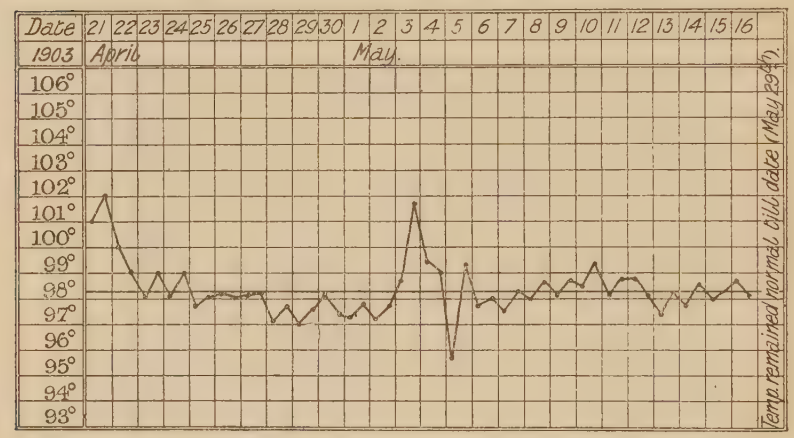
Case 68.—Bara Risgallah (Male). Age 35 years. Trypanosoma fever. Tribe Lendu. Occupation, Police. Lives in hut in police lines.

April 21, 1903. Admitted to hospital. This man states he has been ill 10 days, and that the ailment began with a shivering fit. He also says he had a sickness like this in Kampala 4 or 5 years ago.

April 24. Patient looks ill. There is no œdema, and only the glands in the groin are slightly enlarged His pulse is 108, feeble, compressible. The heart sounds are normal. He has no tremors.

The following chart represents the course of the disease :—



The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid :—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Apr. 12....	+		+		—
May 4....			+		—
„ 11....			+		

From these cases it will be seen that these trypanosomes do not visibly affect the health of their native hosts. All the men are at duty and say they feel strong and well. It is a curious fact that although the parasites are found in the blood they have never been seen in the cerebro-spinal fluid. The question seems to resolve itself into this : either the trypanosomes found in sleeping sickness and those found in

Table IV.—List of Controls up to Present Time.

Date.	Name.	Trade.	Sex.	Centrifuged.	Filaria.	Trypanosoma.	
1903.							
Apr. 23	Airara	Prisoner	Male	10 c.c.	+	—	Healthy.
,, 23	Biggity	,,	,,	,,	+	—	,,
,, 24	Nathaniel	Dispensary	,,	,,	—	—	Case in hospital.
,, 28	Chia Msoga	,,	,,	,,	+	—	,, ,,
,, 29	Aradiki	,,	,,	,,	+	—	,, ,,
,, 29	Arkadi	,,	,,	,,	+	—	,, ,,
,, 29	Mandandiki	,,	,,	,,	—	—	,, ,,
May 6	Jumabini	Prisoner	,,	,,	—	—	Healthy.
,, 8	Matea	Dispensary	,,	,,	+	—	Circumcision.
,, 13	Bifarawala	Prisoner	,,	,,	+	—	Healthy.
,, 16	Amuri Abdulla	,,	,,	,,	—	—	,,
,, 18	Serewame	,,	,,	,,	—	—	,,
,, 21	Juma Bin Abdullah	,,	,,	,,	—	—	,,
,, 22	Baraca Bin Salimi	,,	,,	,,	—	—	,,
,, 27	Musa	,,	,,	,,	+	—	,,
,, 27	Weraga	,,	,,	,,	+	—	,,
,, 28	Wanika	,,	,,	,,	+	—	,,
,, 29	Baki	,,	,,	,,	+	—	,,

trypanosoma fever belong to different species and give rise to different diseases, or they are one and the same, and if confined to the blood give rise to slight feverish symptoms, whereas if they gain entrance to the cerebro-spinal fluid they give rise to sleeping sickness. The question cannot be answered at present, but doubtless a solution will be found before long.

But with the exception of these six cases who came for medical treatment on account of fever, no trypanosomes have been found in the blood of the general population. (See Table on p. 23.)

6. *Can any Difference be made out Microscopically between the Trypanosoma of Sleeping Sickness and that of Trypanosoma Fever?*

The trypanosomes have been so often described of late years, and are beginning to be so well known, that it is unnecessary for us to give a general description of them.

In order to make out if any difference in shape and size exists between the trypanosoma of sleeping sickness and of trypanosoma fever, ten parasites were measured in each of ten cases and an average taken. The length, the distance of the micro-nucleus from the posterior extremity and the presence or absence of chromatic dots were the points fixed on.

The following table shows the results:—

Table V.—Trypanosomes of Sleeping Sickness.

Name.	Length.	Chromatic dots.	Distance of micro-nucleus from posterior end.
	μ	Per cent.	μ
Zakubu	21·5	10	0·5
Waiswa	19·0	70	0·2
Kidorme	20·4	10	0·4
Katola	26·1	10	1·0
Warasansa	21·8	0	0·25
Average	21·7	20	0·47

Table V.—*continued.*—Trypanosoma Fever.

Name.	Length.	Chromatic dots.	Distance of micro-nucleus from posterior end.
	μ	Per cent.	μ
J. M.	17·8	0	1·0
Jordien Murjan.....	28·0	0	2·1
Bara Risgallah.....	27·4	20	1·4
Karala Barigi.....	25·2	0	1·1
Tabula	23·2	0	2·1
Average.....	24·3	4	1·5

From Table V it would appear that the trypanosomes found in sleeping sickness are shorter, have chromatic dots more frequently, and the micro-nucleus is situated nearer the end than in the other. Whether this should have any weight in determining the question as to specific difference it is difficult to say. At present it seems better to be content with noting facts and wait for further knowledge. In the *Trypanosoma Brucei* differences in size and shape were noted in different animals, and Bradford and Plimmer state that differences are seen at different stages of the disease in the same animal. It is curious that the shortest form is found in J. M. who was supposed to be suffering from trypanosoma fever, and a monkey inoculated from him showed the same short fat forms.

We attach a few rough sketches of trypanosomes from various cases (Plates 1—3).

7. *Can any Difference be made out between these Trypanosoma by Experiments?*

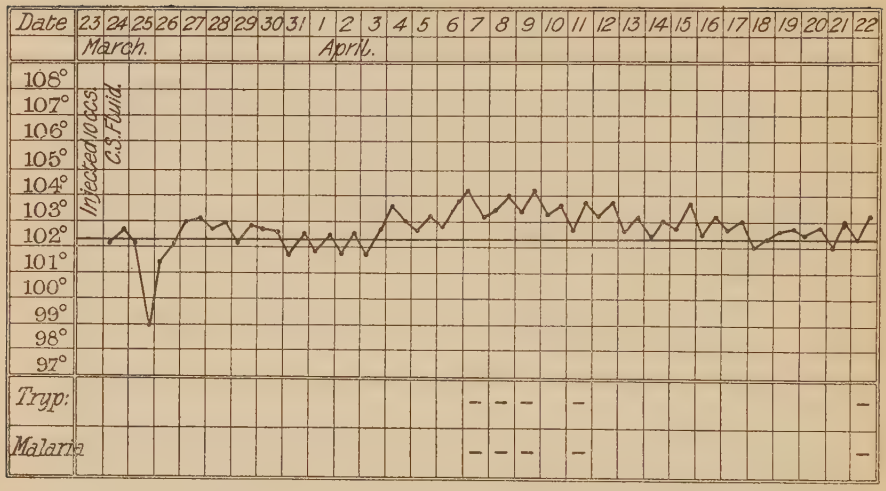
The Trypanosoma of Sleeping Sickness in the Monkey.

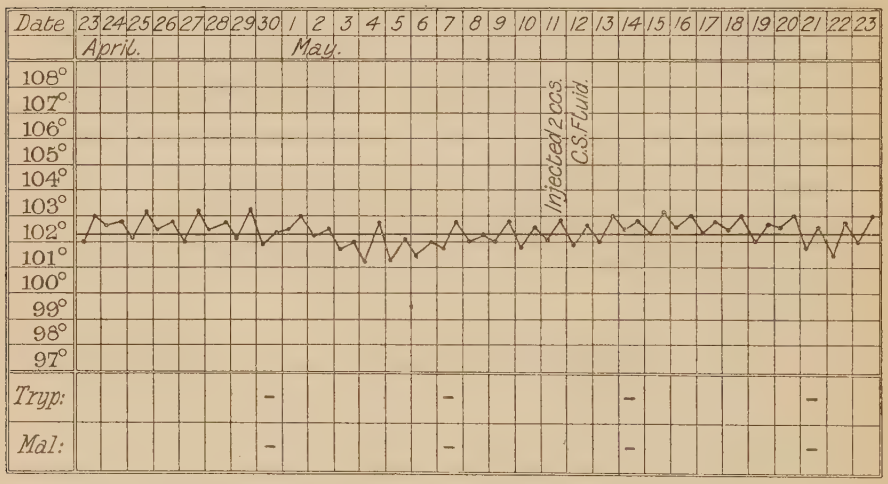
EXPERIMENT 1.—Monkey (Male). Pale-faced variety.

To note the effect of the subcutaneous injection of cerebro-spinal fluid containing trypanosomes.

March 23, 1903. Injected 10 c.c. of cerebro-spinal fluid taken, *post mortem*, from Case 18, Kaperi, under the skin of the left side of monkey.

The following chart represents the temperature and the presence or absence of malaria and trypanosoma:—





May 28. Malaria absent. Trypanosomes *present*.

Remarks.—The pale-faced variety of monkeys were brought by us from England. We do not know the name of the species, but the attached photograph (Plate 4, fig. 7) will show. None of these English monkeys harbour malaria parasites, as most of the local species do.

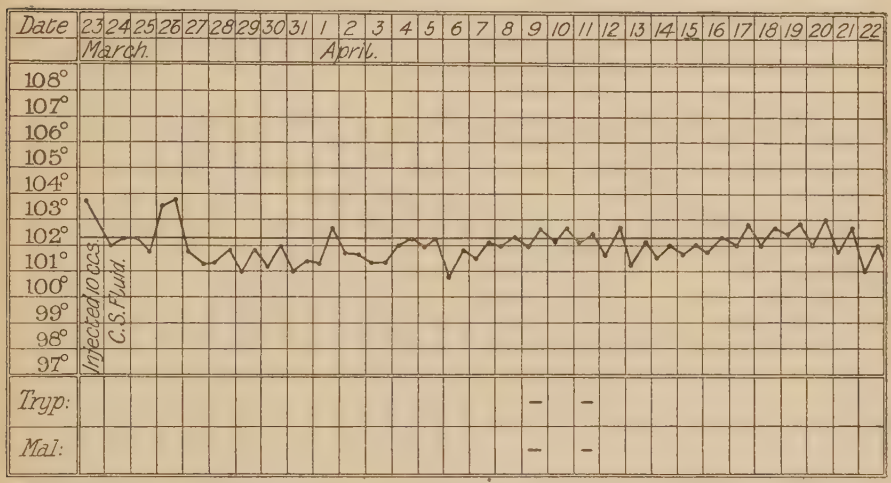
The first injection of cerebro-spinal fluid evidently did not contain any living trypanosoma. This may be due to the fact that the fluid was taken *post mortem*, and the trypanosomes soon disappear in the dead body. On May 11, the monkey was re-injected and the

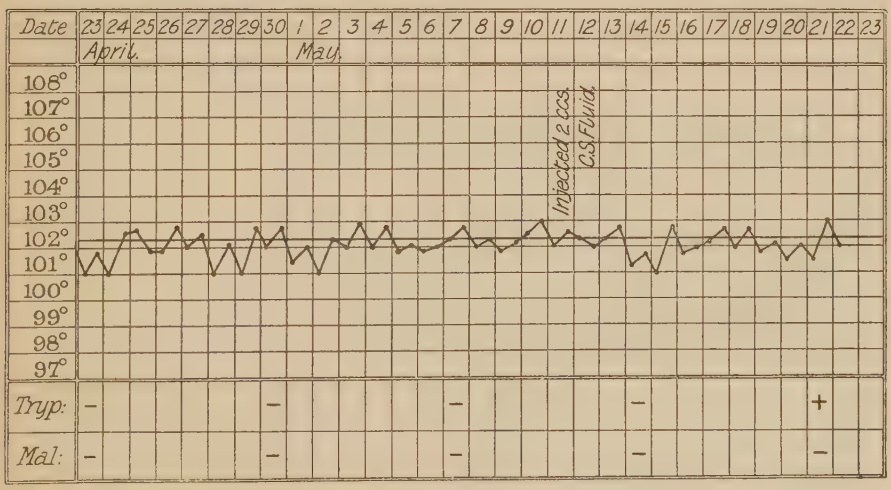
parasite appears in the blood 17 days later. The temperature chart is given to show the normal temperature of a monkey.

EXPERIMENT 2.—Monkey (Male). Pale-faced variety.

March 23, 1903. Injected sediment of about 10 c.c. of cerebro-spinal fluid, taken *post mortem*, from Case 18, Kaperi.

The following chart represents the temperature and the presence or absence of malaria and trypanosoma:—





Remarks.—This is a parallel experiment to No. 1, and in this also the first injection remained barren. Ten days after the second

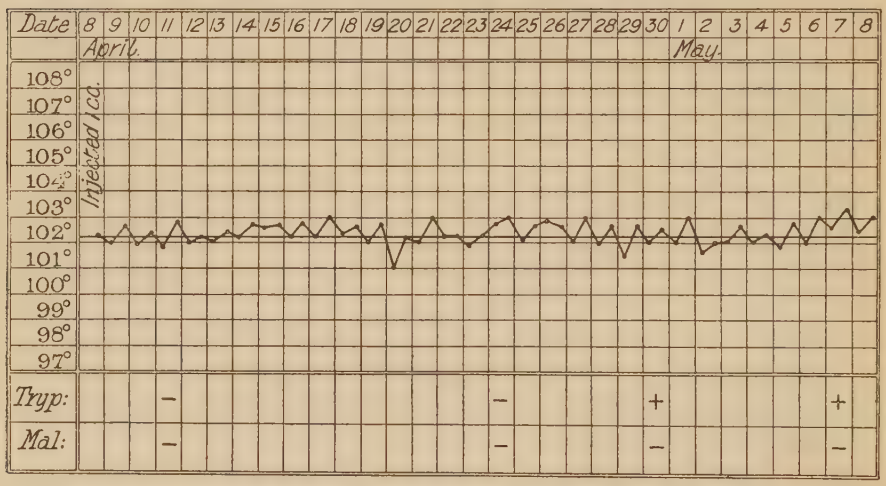
injection, the trypanosomes appear in the blood. This appearance of the trypanosomes is not heralded by any change in the temperature, and the monkey shows no signs of disease.

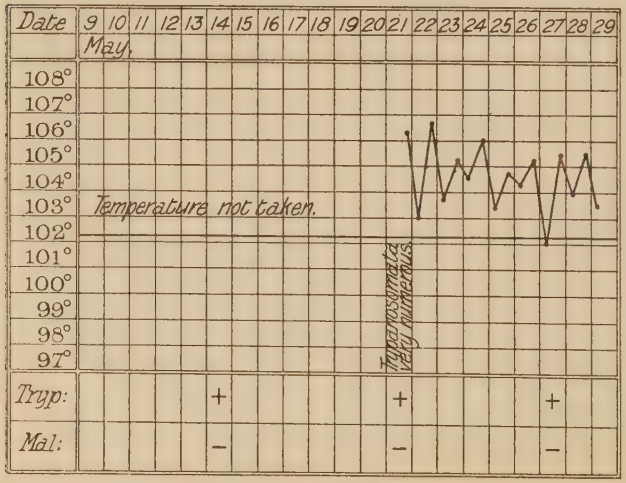
EXPERIMENT 34.—Monkey (Male). Pale-faced variety.

To note the effect of injecting the cerebro-spinal fluid from a case of sleeping sickness into the vertebral canal of a monkey.

April 8, 1903. Injected 1 c.c. of cerebro-spinal fluid containing trypanosomes from a case of sleeping sickness into the spinal canal of this monkey.

The following chart represents the temperature and the presence or absence of malaria and trypanosoma :—





Remarks.—The chief point of interest in this case is the increase in number of the trypanosomes about May 21, and the rise of temperature at the same time. It cannot be said that this animal shows any symptoms of sleeping sickness up to the present time.

EXPERIMENT 95.—Monkey. Black-faced variety. (Plate 4, fig. 8.)

May 13, 1903. Blood examined, there was no malaria or trypanosoma.

May 14. Injected 1 c.c. of cerebro-spinal fluid from a case of sleeping sickness into the vertebral canal of this monkey.

May 22. Trypanosoma absent. Malaria absent.

„ 29. „ „ „ „

EXPERIMENT 96.—Monkey. Black-faced variety.

May 14, 1903. Blood examined. No malaria, no trypanosoma.

„ Injected 1 c.c. of cerebro-spinal fluid from a case of sleeping sickness into the vertebral canal of this monkey.

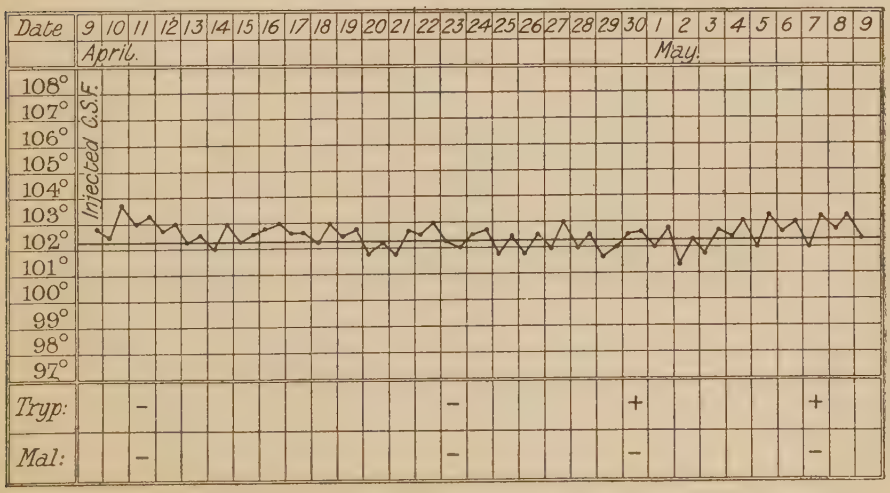
May 22. Trypanosoma absent. Malaria present.

„ 29. „ „ „ „

Remarks.—After 15 days the trypanosomes are still absent from the blood.

EXPERIMENT 54.—Monkey. Black-faced variety.

To note the effect of injection of cerebro-spinal fluid containing trypanosomes, from a case of sleeping sickness, into the brain cavity of a monkey.



April 9, 1903. Injected 1 c.c. of cerebro-spinal fluid from a case of sleeping sickness into the brain cavity of this monkey through the foramen magnum.

The preceding chart represents the temperature and presence or absence of trypanosoma and malaria.

May 14. Trypanosoma present. Malaria absent.
„ 21. „ „ „ „
„ 28. „ „ „ „

Remarks.—The trypanosomes appeared in the blood 21 days after injection.

EXPERIMENT 98.—Monkey. Black-faced variety.

May 14, 1903. Malaria present, trypanosoma absent. Injected 1 c.c. of cerebro-spinal fluid from a case of sleeping sickness into the brain of this monkey through the foramen magnum.

May 22. Trypanosoma absent. Malaria numerous.
„ 29. „ present. „ present.

Remarks.—The parasites appeared in the blood after 15 days.

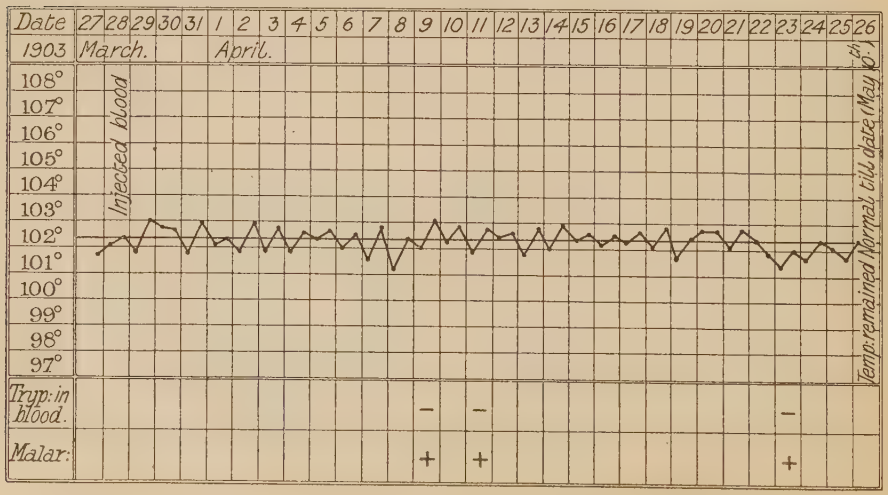
The Trypanosome of Trypanosoma Fever in the Monkey.

EXPERIMENT 6.—Monkey. Black-faced variety.

To ascertain if the trypanosome of trypanosoma fever is pathogenic to monkeys.

March 28, 1903. Injected 4 c.c. of blood from Dr. Baker's case Kumsasabba, a policeman whose blood contained trypanosomes yesterday.

The following chart represents the temperature and the presence or absence of trypanosoma and malaria :—



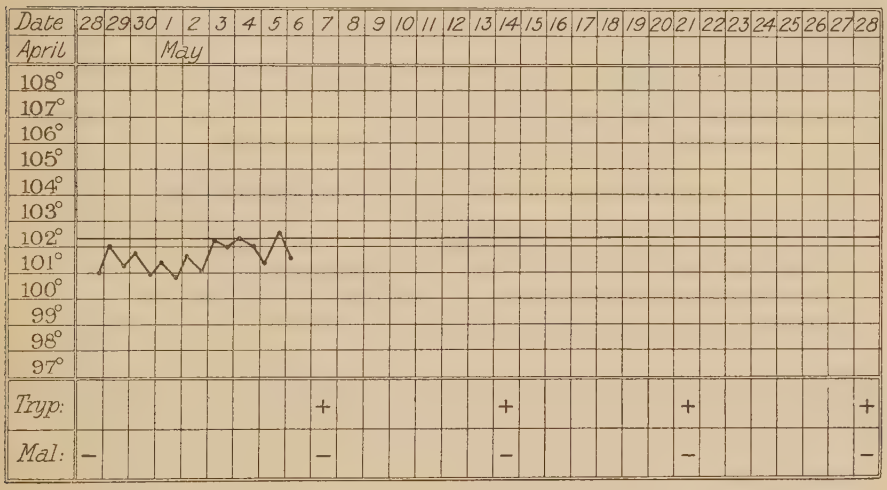
April 30. Malaria present. Trypanosoma absent.
May 7. ,, ,, ,, present.
,, 24. ,, ,, ,, ,,
,, 21. ,, ,, ,, ,,
,, 28. ,, ,, ,, ,,

Remarks.—The trypanosomes appeared in the blood on May 7, 40 days after the injection of blood.

EXPERIMENT 61.—Monkey. Pale-faced variety.

April 28. Injected 2 c.c. of blood from Case 66, Tabula, marine, containing trypanosoma, into the spinal canal.

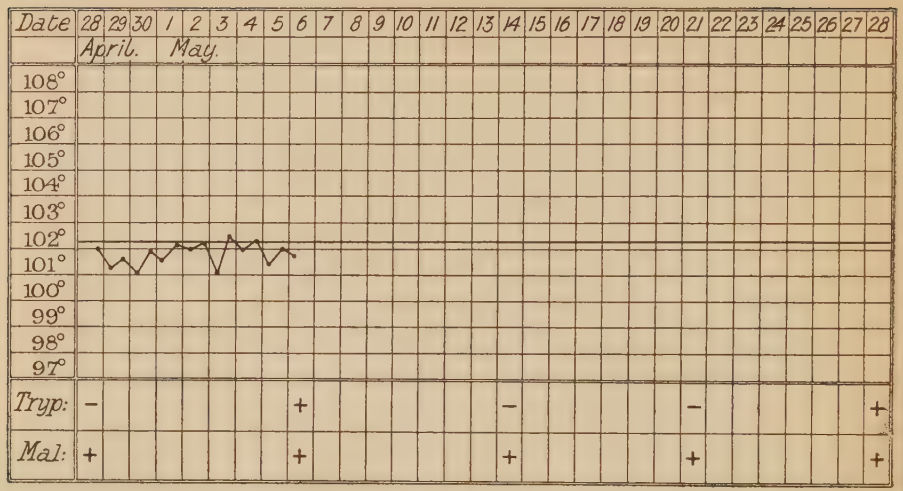
The following chart represents the temperature and presence or absence of trypanosoma and malaria :—



EXPERIMENT 56.—Monkey. Pale-faced variety.

April 28. Injected 2 c.c. of blood from Case 66, Tabula, marine, containing trypanosoma into the spinal canal of this monkey.

The following chart represents the temperature and resence or absence of trypanosoma and malaria :—

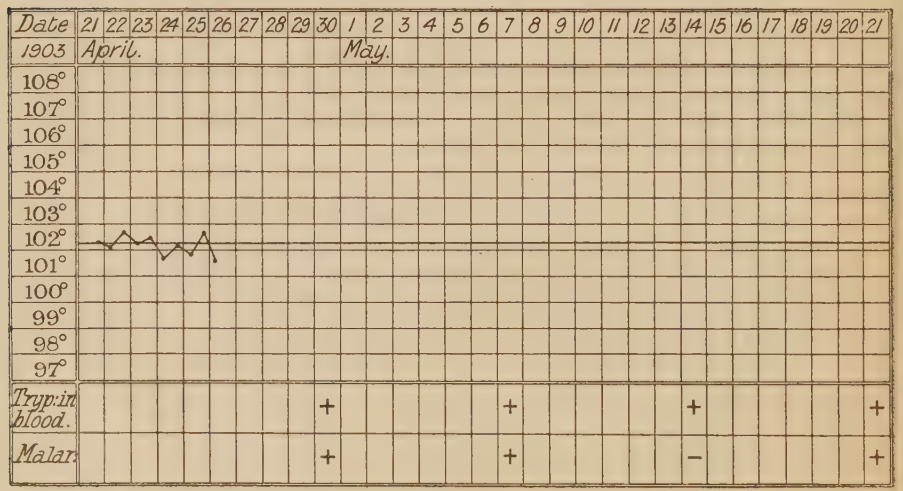


Remarks.—The temperatures were not continued after the first week on account of want of labour.

EXPERIMENT 58.—Monkey. Black-faced variety.

April 21. Injected subcutaneously 3 c.c. of blood, containing trypanosomes from Case 68, Bara Risgallah, marine.

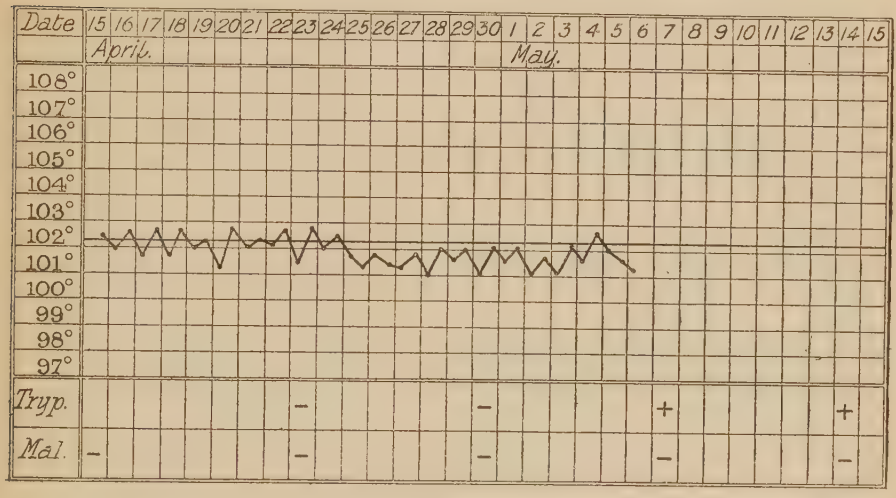
The following chart represents the temperature and presence or absence of trypanosoma and malaria:—



EXPERIMENT 60.—Monkey. Pale-faced variety.

April 15. Injected subcutaneously 2 c.c. blood from Case 66, Tabula, marine, containing trypanosoma.

The following chart represents the temperature and presence or absence of trypanosoma and malaria :—



May 21. Trypanosomes very numerous. Malaria absent.

„ 28. „ „ „ „ „

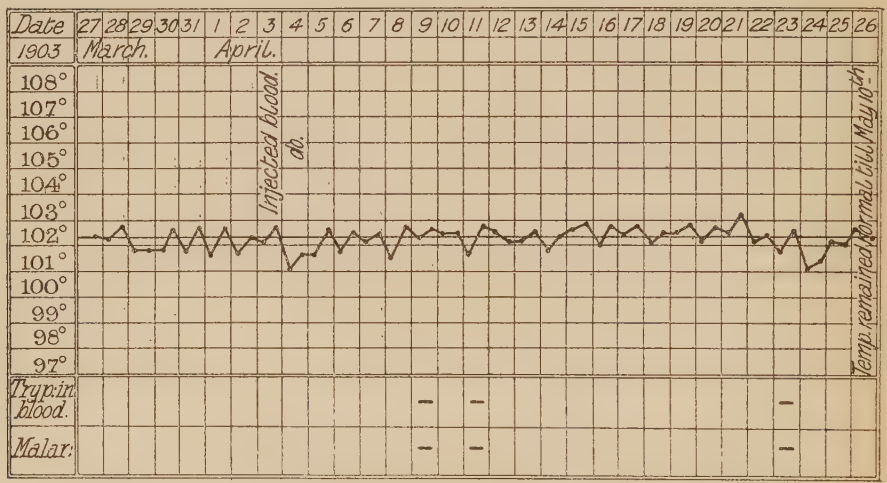
EXPERIMENT 8.—Monkey. Black-faced variety.

April 3. Injected subcutaneously a small quantity of blood from Case J. M., whose blood is seen to contain trypanosomes this morning. The blood taken only amounted to a drop or so and had firmly clotted.

April 4. Injected about 1 c.c. of blood from same case.

May 11. Injected 2 c.c. of blood from Jordien Murjan.

The following chart represents the temperature and presence or absence of trypanosoma and malaria :—



April 30. Malaria absent. Trypanosoma absent.
May 7. ,, ,, ,, ,,
,, 14. ,, ,, ,, ,,
,, 21. ,, ,, ,, ,,
,, 28. ,, ,, ,, ,,

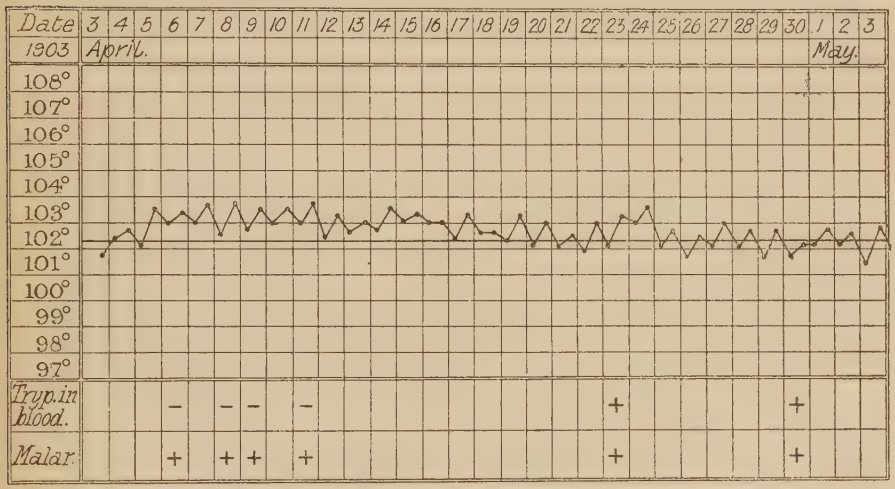
Remarks.—The parasites appear in the blood after 10 days, after the last injection.

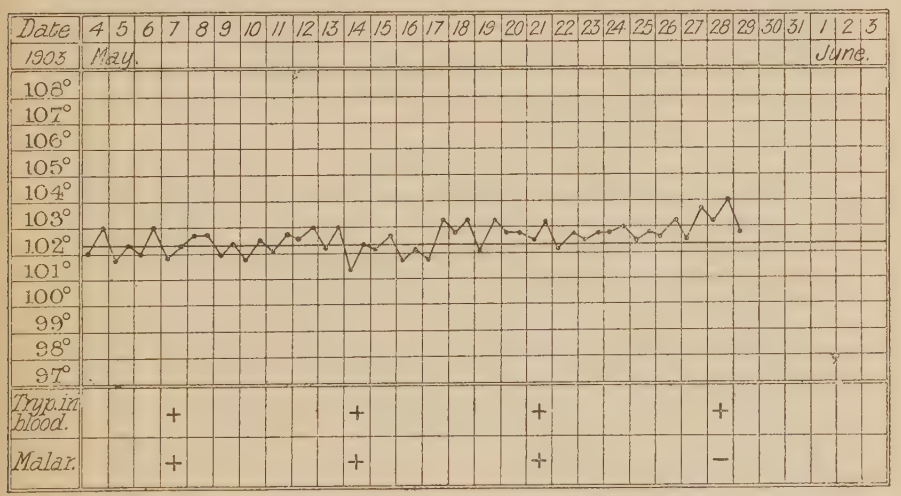
EXPERIMENT 32.—Monkey. Black-faced variety.

April 3. Injected ½ c.c. of blood from Case 44, J. M., containing trypanosomes.

April 4. Injected 1 c.c. of blood from the same case.

The following chart represents the temperature and presence or absence of trypanosoma and malaria :—





From these experiments on the monkey, it is evident that no deduction can be made at present as to the identity or otherwise of the

trypanosomes, found in cases of sleeping sickness and those found in trypanosoma fever.

Rats, guinea-pigs, dogs, sheep, goats, donkeys, and oxen are also under observation, but the results are not sufficiently definite to merit particular description.

In the rat both trypanosomes appeared on the 11th day.

In the dogs in one case the trypanosomes from a case of sleeping sickness appeared in the blood in 38 days. In two dogs inoculated with blood from a case of trypanosoma fever, the trypanosomes appeared in 13 and 19 days respectively.

8. *Does the Distribution of Sleeping Sickness coincide with the Distribution of any biting Insect?*

The distribution of Sleeping Sickness in Uganda is striking. Speaking broadly, the disease only occurs along the northern shores of the Victoria Nyanza, in a strip of country about 15 miles wide.

The Prime Minister of Uganda informs me that any cases which are found further inland are imported. The numerous islands which lie near the northern shores of the lake are also the seat of the disease. Between these islands and the mainland and for several miles inland, a constant interchange of commodities, and intercourse between the natives takes place.

There must be some reason for this peculiar distribution. It cannot be due to a food poison, as the natives outside this narrow strip have the same habits. Then again, if the trypanosomes are the cause of the disease, which there is every reason to suspect, they cannot be conveyed by food or clothes, or directly from man to man, but must be carried by some blood-sucking insect. Naturally on the analogy of Nagana a Tsetse Fly was suspected. But the tsetse is not supposed to be present at altitudes of 3,000 feet and upwards, nor is it supposed to be found in Uganda. A short search in the Botanical Gardens, Entebbe, disposed of these objections. A tsetse fly very similar to the one met with in the Fly Country, Zululand, was found in numbers. At present and for some time past we have hundreds of live tsetse flies brought into the laboratory every day by a couple of native children. The flies must be swarming in the vicinity of Entebbe. This gave a lead. The Regents were asked to meet the Commission and have the matter explained to them. They at once recognised the fly as one known to the Muganda as Kivu, and said that it was found along the shores of the lake.

The chiefs were supplied with several dozen nets, killing bottles and boxes, and on their part promised to have the distribution of the fly worked out. A letter was also addressed to Bishops Tucker and Hanlon, who kindly promised to obtain information on this point

from the Missionaries. To each Missionary was sent a specimen of the tsetse fly and instructions as to collecting them. It is too early to give results, but up to the present the distribution of the Tsetse Fly and Sleeping Sickness agree. In a few weeks we expect to have sufficient data to enable us to make a definite statement.

* What species of tsetse fly is found here, has not been made out. There seem to be two varieties, one darker than the other, and both darker than the Zululand species. The Uganda species is also smaller than the Zululand, the males averaging 9 mm. in length and the females 10 mm., whereas the latter measured 11 mm. and 12·5 mm. respectively. It is unnecessary for us to go more fully into this question of species, since specimens have been sent to Mr. Austen of the British Museum, and by this time the Committee will doubtless have his report.

Another point in this connection must be touched upon. Dr. Moffat in travelling from Mombasa to Port Florence caught three different kinds of tsetse fly in the railway carriage, whilst passing through the coast fly belt. This raises the question as to whether the coast tsetse flies can carry the sleeping sickness trypanosoma. If they do there is danger of the disease passing into the coast fly belt. This raises the next question.

9. *Can the Uganda Tsetse Fly carry the Trypanosoma found in Sleeping Sickness Cases from Animal to Animal?*

This has not been proved yet, but experiments are being made which should decide the question in a short time. Curiously at this very moment word is brought that one of these experiments has proved successful, and that a most important one. We shall give it in full.

Experiment 94.—Monkey. Black-faced variety.

To ascertain if tsetse flies freshly caught in the vicinity of Entebbe are carrying trypanosomes.

May 13.	Blood examined.	No trypanosomes.	No malaria.		
„ 13.	Fed 31 flies freshly caught near Entebbe.				
„ 15.	„ 15	„	„	„	
„ 18.	„ 10	„	„	„	
„ 19.	„ 7	„	„	„	
„ 19.	„ 13	„	„	„	
„ 20.	„ 13	„	„	„	
„ 21.	„ 16	„	„	„	

* 29.5.03.—A letter has just been received from Mr. Austen informing us that the Uganda species is *Glossina palpalis*. He states that this is a West African species, and its occurrence in Uganda is very interesting and was quite unexpected by him.

Blood examined. No trypanosomes. No malaria.
May 22. Fed 20 flies freshly caught near Entebbe.
„ 23. „ 14 „ „ „
„ 23. „ 11 „ „ „
„ 24. „ 17 „ „ „
„ 25. „ 14 „ „ „
„ 25. „ 8 „ „ „
„ 25. „ 9 „ „ „
„ 26. „ 7 „ „ „
„ 26. „ 11 „ „ „
„ 27. Trypanosomes *present.*

This important experiment has succeeded quicker than we anticipated. It is impossible with our present knowledge to tell if the trypanosomes, carried by the tsetse flies to the monkey, are the same as those found in cases of Sleeping Sickness, but the result is very striking.

The flies were caught in the vicinity of the hut-tax labourers' camp. These men, to the number of thousands, come to Entebbe and work for Government for 1 month in lieu of paying hut tax. They live in rudely built grass huts near the shores of the lake about a mile from Entebbe along the Kampala road. Tsetse flies caught at this place and brought in cages to the laboratory have conveyed trypanosomes to a monkey. What could be more suggestive? The Prime Minister of Uganda told us he considered the hut-tax system as the chief cause of the sowing of Sleeping Sickness all over the land.

More work is required before an opinion can be expressed.

The Commission leave the question for the present at this stage with the conviction that they have at least given the Committee some material for consultation and suggestion.

The Commission think it well even at this early stage to express their heartiest thanks to Colonel Sadler, C.B., H.M. Commissioner, Uganda, for his invariable kindness and good offices; to Dr. Moffat, C.M.G., who has been untiring in help; to Dr. Hodges, Acting P.M.O. during Dr. Moffat's absence; to Dr. Baker, the resident colonial surgeon in Entebbe, who has spent most of his spare time in working with and for the Commission; to Dr. Wiggins, of Kisumu, who has given valuable assistance; to Mr. Stanley C. Tomkins, Assistant Commissioner, who has been assiduous in sending us collections of biting flies; and lastly to the Prime Minister and Regents of Uganda, who are now making out the distribution of tsetse flies in Uganda and have throughout shown great interest in the work.

Appendix.

As we understand the members of the previous Commission sent out by the Royal Society are preparing an elaborate report on the clinical features of this disease, we shall confine ourselves for the present to merely sending a few completed histories of cases which have been under our care. In our opinion the reading of a few cases will give as good an idea of the disease as is required for our purpose at the present time. It is customary to divide the disease into three stages. In the first stage there is usually fever and in rare cases symptoms of exaltation or even mania, but as a rule the patient is quiet and the facial expression is dull, otherwise there is nothing noteworthy. In the second stage, there is paresis of gait and speech, tremors of the tongue, lips and hands, and the dullness of expression deepens. In the third stage these symptoms have become more pronounced and the patient is confined to bed in a condition of complete lethargy.*

Case 4.—Kaperi (Male). Age 8 to 10 years.

July 15, 1902. Admitted to hospital under Dr. Castellani's and Dr. Low's care.

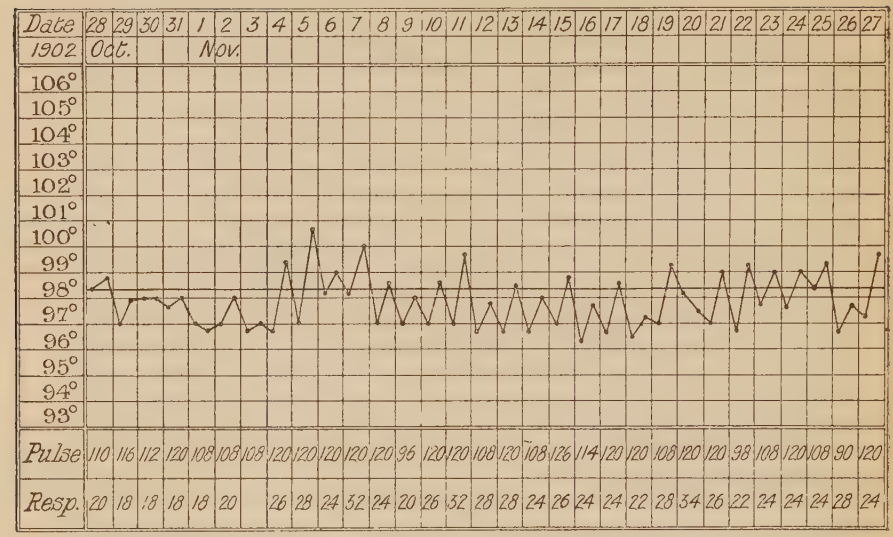
March 22, 1903. The temperature chart shows a rise to 100—101° F. at night during July. Later it was more irregular. In December, 1902, it rose for a week, also in January and February, 1903. It has been sub-normal during the whole of March.

At the present time this boy is very thin. There is a commencing bed sore on the right hip. He understands questions when spoken to. He lies with the thighs drawn up on the abdomen. The fingers of the right hand are flexed in the palm, and the right wrist is also kept flexed, and he is unable to extend either his fingers or wrist. He can neither stand nor walk. He complains of pain in legs and thighs. His tongue is furred and is not tremulous. No tremor of left hand. Knee-jerk is absent. He takes milk, which he swallows easily. No nystagmus. Slight enlargement of glands in groin.

March 23. At 10 A.M., Dr. Castellani drew off about 40 c.c. cerebro-spinal fluid. Microscopically this fluid is teeming with cocci, single, in pairs, and in short chains. 20 c.c. of the fluid was centrifuged 15 minutes. The sediment contained many trypanosomes. The boy died at 3 P.M.

The following chart represents the course of the disease:—

* [Some discrepancies may be observed between the charts and the clinical notes. It was deemed desirable not to defer the publication until these could be corrected by the authors.—Sec. R.S.]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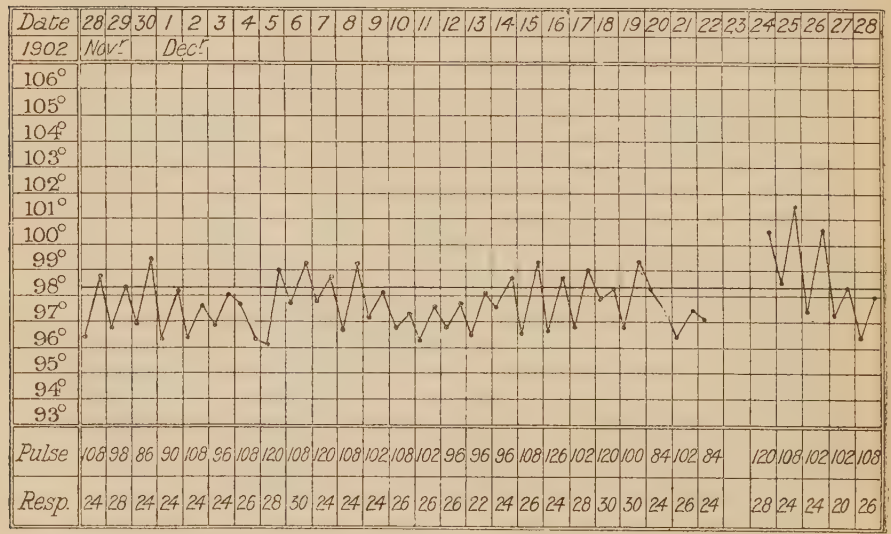
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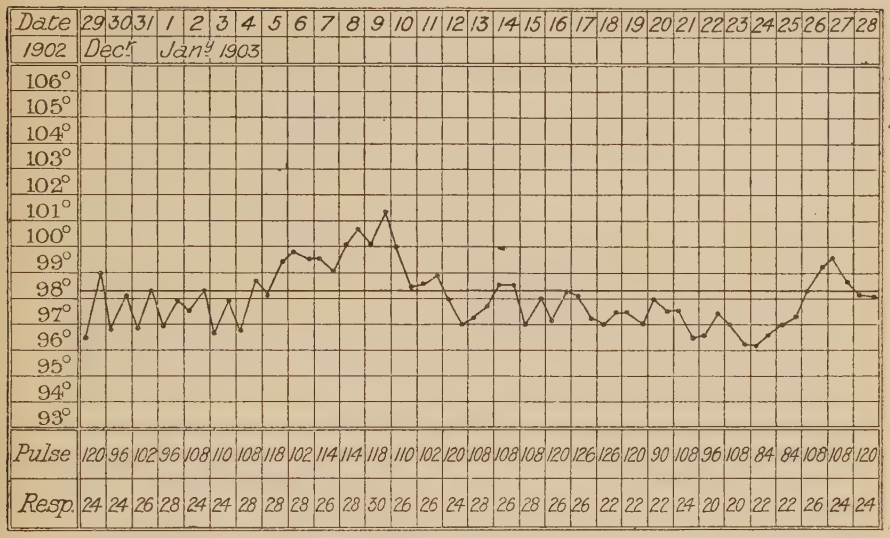
Date 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
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106° 105° 104° 103° 102° 101° 100° 99° 98° 97° 96° 95° 94° 93°
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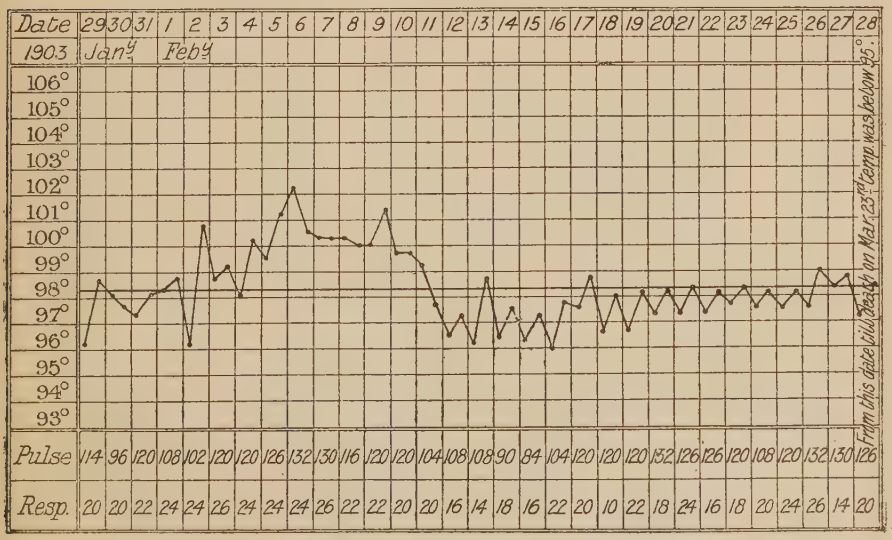
Date 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
1903 Jan.y Feb.y
106° 105° 104° 103° 102° 101° 100° 99° 98° 97° 96° 95° 94° 93°
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Resp. 20 20 22 24 24 26 24 24 24 26 22 22 20 20 16 14 18 16 22 20 10 22 18 24 16 18 20 24 26 14 20
From this date till Sept. on Mar. 23rd temp. was below 95°.

The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid:—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903. Mar. 23....				−	+

Post-mortem 2 hours after death.

Rigor mortis, absent. The body is that of an emaciated child about 8 to 10 years of age. There are no bed sores, but his feet are scabbed in places evidently due to jiggers.

On making an incision from the chin to the pubic region and reflecting the parietes, no fluid is found in the peritoneal cavity. The spleen is enlarged, remaining viscera appear healthy. On opening the chest cavity, no fluid is found in the pleural or pericardial cavities.

Heart.—Is flabby, the muscular tissue pale, otherwise normal.

Lungs.—Both lungs are perfectly healthy.

Liver.—Is pale, slightly fatty, otherwise healthy.

Spleen.—Is the usual malarial spleen, deeply pigmented, colour dark chocolate, firm, end fibrous to the touch.

Stomach and Intestines.—Externally normal.

Brain.—On removing the calvarium, the dura mater is non-adherent, smooth, pale in colour and fairly normal in appearance. The longitudinal sinus is filled with clotted blood. On cutting through the dura mater and reflecting it, the brain surface presents a highly diseased appearance. The dura mater is not adherent to the brain. The surface of the brain is in a condition of purulent meningitism. The small vessels are intensely congested. The convolutions are dusky red in colour or rather dotted with intense crimson on a yellowish ground (Plate 5).

Between the convolutions the sub-arachnoid fluid is in excess, is greenish-yellow in colour and evidently purulent.

Parts of the brain and spinal cord were put aside for microscopical examination. The fluid from the lateral ventricles is not purulent, but merely turbid, not from the presence of white blood corpuscles, but probably from the presence of innumerable cocci. This fluid also contains trypanosomes.

Remarks.—In our experience these acute inflammatory cases are not usual. In this case it is evidently due to streptococcal invasion.

This appearance is not typical of sleeping sickness; as a rule, there

are no signs of acute inflammation, but merely a flattening of the convolutions, an injection of vessels, and an excess of sub-arachnoid fluid.

In Kaperi's case the cerebro-spinal fluid and blood were teeming with streptococci which would probably account for the acute inflammatory condition.

CASE 35.—Fatoma (Female). Age 18 years. District, Usoga.

January 7, 1903. Admitted to hospital. States she had been ill for four months before coming into hospital. No relations had died of sleeping sickness. Has had syphilis.

April 7. *General Condition.*—Nutrition, flabby. Lips cracked. Gait weak and uncertain. Intelligence dull. Expression of face nothing noteworty. No œdema. Lymphatic glands generally enlarged.

Nervous System.—Intelligence dull. Sleeps much during the day. Speech indistinct and weak. Tongue furred, moist. No tremor of tongue, lips, or hands. Knee-jerks present. Ankle clonus absent.

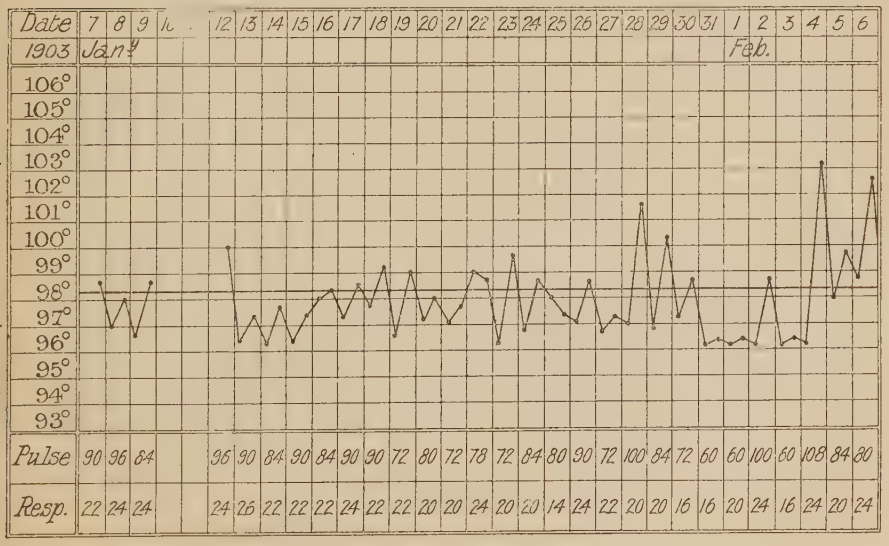
Alimentary System.—Appetite good. Liver and spleen not enlarged.

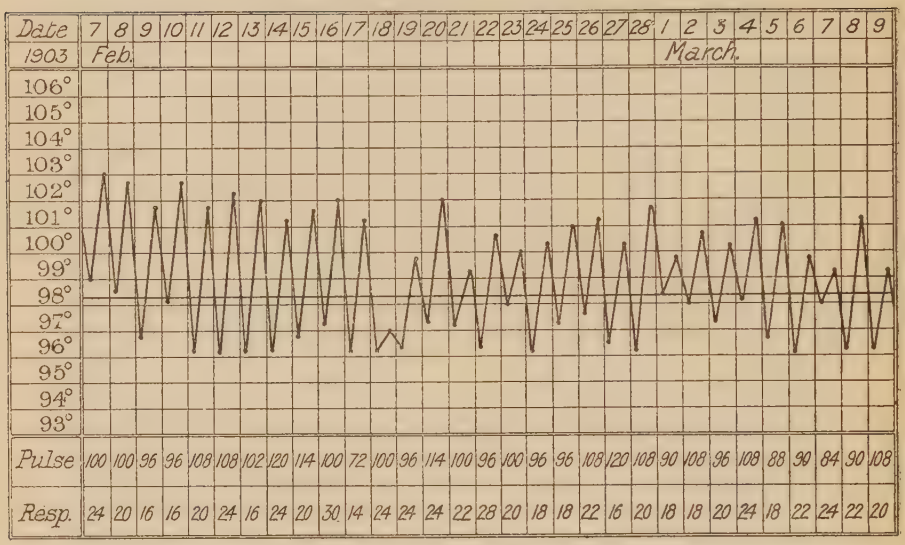
Respiratory System.—She has a cough. No physical signs of disease.

Cutaneous System.—There is an eruption of psoriasis over the trunk and extremities, probably syphilitic.

May 22. Died.

The following chart represents the course of the disease :—

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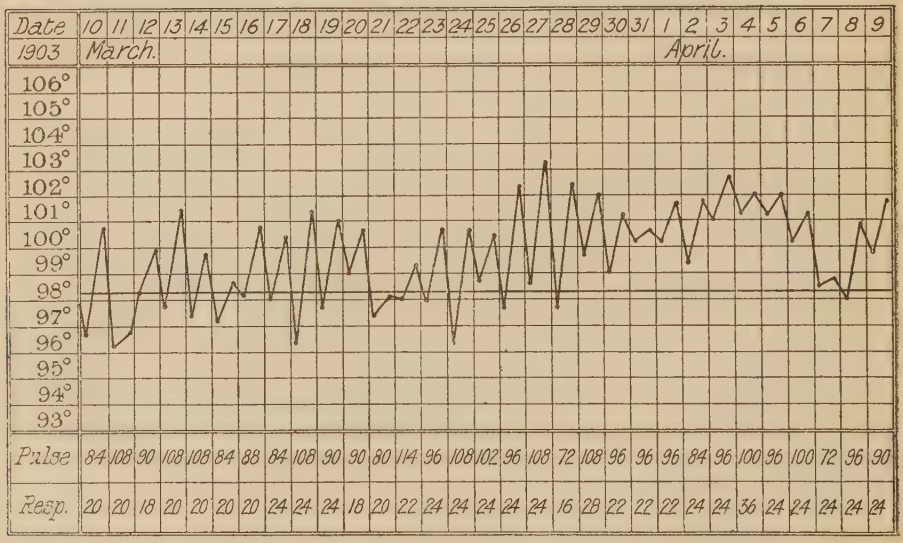
1903 Feb. March.
106° 105° 104° 103° 102° 101° 100° 99° 98° 97° 96° 95° 94° 93°
Pulse 100 100 96 96 108 108 102 120 114 100 72 100 96 114 100 96 100 96 96 108 120 108 90 108 96 108 88 90 84 90 108
Resp. 24 20 16 16 20 24 16 24 20 30 14 24 24 24 22 28 20 18 18 22 16 20 18 18 20 24 18 22 24 22 20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1903 March. April.
106° 105° 104° 103° 102° 101° 100° 99° 98° 97° 96° 95° 94° 93°
Pulse 84 108 90 108 108 84 88 84 108 90 90 80 114 96 108 102 96 108 72 108 96 96 96 84 96 100 96 100 72 96 90
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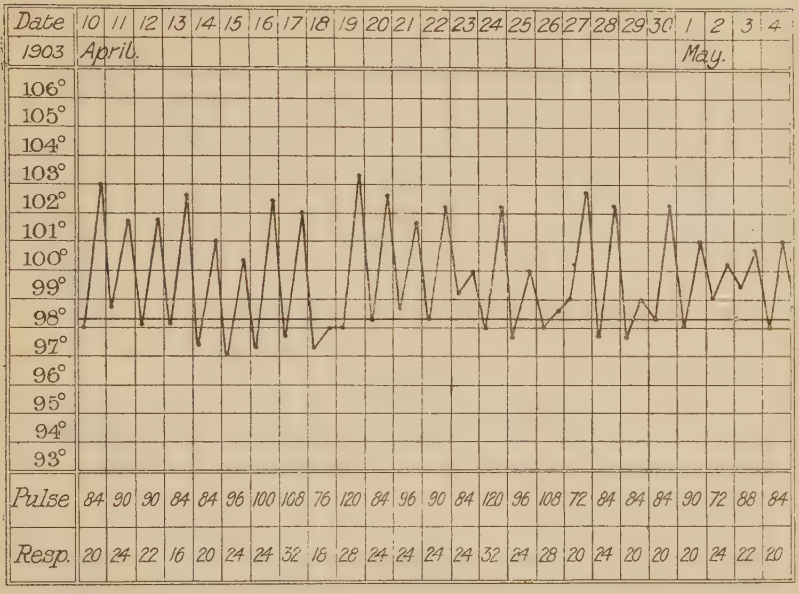

Date 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 1 2 3 4
1903 April. May.
106° 105° 104° 103° 102° 101° 100° 99° 98° 97° 96° 95° 94° 93°
Pulse 84 90 90 84 84 96 100 108 76 120 84 96 90 84 120 96 108 72 84 84 84 90 72 88 84
Resp. 20 24 22 16 20 24 24 32 16 28 24 24 24 24 32 24 28 20 24 20 20 20 24 22 20

Date 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
1903 May.
106° 105° 104° 103° 102° 101° 100° 99° 98° 97° 96° 95° 94° 93°
DIED 11.30 a.m.
Pulse 108 96 84 100 78 84 90
Resp. 20 22 18 20 20 18 14

The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid :—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Mar. 26....					−
Apr. 1....					+
„ 22....		−			

May 22. *Post-mortem* 2½ hours after death.

Rigor mortis not yet present. The body is that of a young woman fairly well nourished, scaly eruption over body, and commencing bed-sore on the hips. There is slight enlargement of the superficial lymphatic glands.

Body opened in the usual way. About 3 oz. clear straw-coloured fluid found in the pericardial cavity, none in pleural or peritoneal cavities. The lymphatic glands lying behind the manubrium and over the trachea were found much enlarged, the mass of them as large as a Tangerine orange. From this mass other glands extended up into the neck beneath both clavicles and downwards towards the root of the lungs. On section the glands were either caseating or full of pus.

Heart.—Weighed 6 ozs. Nothing abnormal present. Muscle substance firm and of good colour.

Lungs.—Right, weighed 13½ ozs. The lower part of the upper lobe was solid, and on section showed beads of pus in many places, other parts of this area looked brownish and gelatinous. The lower lobe was congested, but no pus was present.

Left, 6½ ozs. in weight. Congested, but not suppurating anywhere. Near the lower parts there was a small hard nodule, gelatinous on section. The glands in the hilum of the lungs were either caseating or suppurating.

Liver.—The liver is very big, weight 4 lbs. Very firm and tough in consistence. Nothing abnormal on section except some increase of the fibrous trabeculæ.

Spleen.—Weight 8 lbs. Enlarged. Almost universally adherent. On section the surface is dotted with small yellow necrotic areas varying in size from a pin's head to a small pea.

Kidneys.—Each weighed 3½ lbs. Cortex congested, capsule strips readily.

Glands.—The retroperitoneal glands are greatly enlarged, forming a

mass in front of the spine, surrounding the mesenteric vessels and pancreas, and forming a large tumour projecting in the small curvature of the stomach. On removal the mass of glands weighed 1½ lbs. On section most of the glands were converted into collections of pus, some of them being inflamed and in a commencing stage of disintegration. The inguinal glands were slightly enlarged and no signs of pus present in them.

Brain.—Much fluid escaped on removing the skull cap. On removing the dura mater, there was found increase of the sub-arachnoid fluid with the opaque ground-glass appearance of the sulci. Some congestion of vessels on the surface of the brain. Substance tough, otherwise normal.

CASE 19.—Nonbi. Female. Age 30 years.

February 23, 1903. Admitted to hospital.

April 7. She has a heavy look, walks weakly and with hesitation. She talks indistinctly and weakly as if she had a pebble in her mouth. She states that three brothers and four sisters all died of sleeping sickness. She has lately come from Bugonga near Entebbe, but came from Busoga some time ago.

April 18. *General Condition.*—This patient can neither speak nor walk. She is conscious and tries to speak, and has an anxious staring expression. She is well nourished. There is no œdema. The conjunctivæ are pale and anæmic. There are no trophic changes. The lymphatic glands are enlarged to the size of beans. Her breathing is quiet and shallow, and her pulse is almost imperceptible, there are no cutaneous eruptions.

Nervous System.—She is conscious and tries to answer questions, but cannot. She lies all day with her eyes open, absolutely torpid. There is slight lateral nystagmus, the pupils are equal in size and she can see. There is no reaction to light. No facial palsy, and she cannot put out her tongue. She is sensible to touch. There is some twitching of the muscles. Knee-jerk is absent; no ankle clonus.

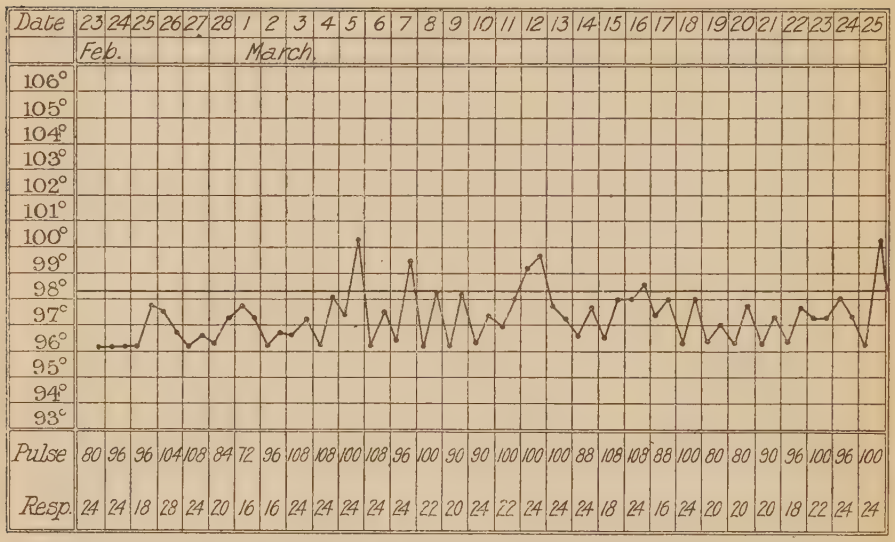
Alimentary System.—Has not been able to eat since yesterday. The spleen is enlarged and hard. The liver is not enlarged. Fæces and urine passed involuntarily.

Circulatory System.—Heart sounds normal, but weak.

Skin.—Is harsh, dry, rough, and scaly on the legs.

April 20. Died at 6 A.M.

The following chart represents the course of the disease :—


Date
23 24 25 26 27 28 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Feb.
March.
106°
105°
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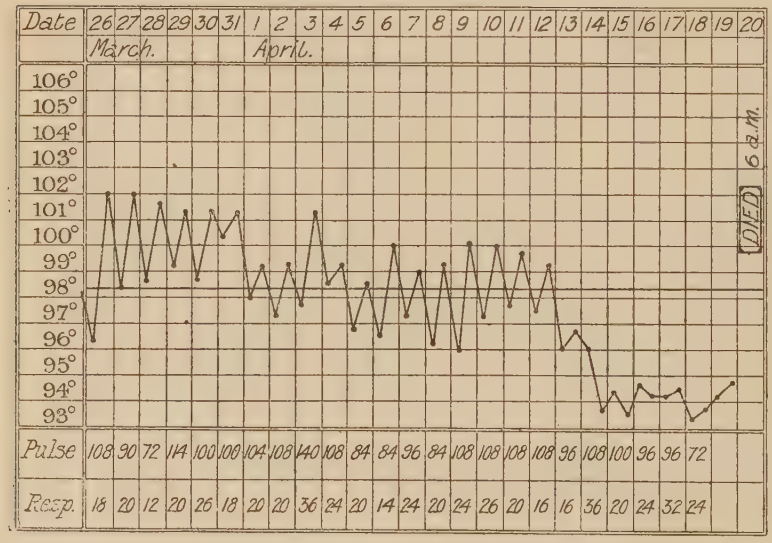
Pulse
80 96 96 104 108 84 72 96 108 108 100 108 96 100 90 90 100 100 100 88 108 108 88 100 80 80 90 96 100 96 100
Resp.
24 24 18 28 24 20 16 16 24 24 24 24 24 22 20 24 22 24 24 24 18 24 16 24 20 20 20 18 22 24 24


Date
26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
March.
April.
106°
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6 a.m.
VOMIT
Pulse
108 90 72 114 100 100 104 108 140 108 84 84 96 84 108 108 108 108 96 108 100 96 96 72
Resp.
18 20 12 20 26 18 20 20 36 24 20 14 24 20 24 26 20 16 16 36 20 24 32 24

The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid :—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Mar. 24....					—
Apr. 13....	+				+
„ 17....	+	—	—		
„ 19....					
„ 19....			—		

April 20. *Post-mortem*, 9 A.M., 3 hours after death.

The body is that of a well-nourished young woman. Rigor mortis is absent. There are no bed sores. The pupils are equal and normal in size. On making an incision from the chin to the pubic region, and reflecting the parietes, there is no fluid found in the peritoneal or pleural cavities.

The pericardium contains an excess of turbid fluid containing flakes of lymph. The pericardium, visceral and parietal, is in an acutely inflamed condition. Its colour is dusky red, and there are flakes of recent lymph over the surface.

Heart.—There is an excess of fat about the base. The whole surface is dark red in colour, especially anteriorly. On section the muscle is pale, otherwise the valves, etc., are normal. No petechiæ on the endocardium.

Lungs.—Right. The glands at the base are enlarged (size of a bean). On section the lower lobe is congested, but no signs of pneumonia. Left lung is normal.

Spleen.—Is much enlarged (8 by 5 inches), and must weigh a couple of pounds. The capsule is partly adherent to the surrounding structures. On section the substance is rather tough, with little or no signs of pigmentation and dark reddish-brown in colour. Smears stained by Leishman's stain showed no malarial parasites.

Liver.—Is not enlarged. There are a few adhesions of the right lobe to the diaphragm. On section the liver tissue is slightly pigmented and fatty. The texture is somewhat tough.

Kidneys.—Normal.

Intestines.—The mesenteric glands are enlarged. There are some round worms, and, 6 inches below pylorus, about 30 ankylostomata Nothing else noteworthy.

Brain.—The dura mater is normal. The convolutions of the surface

of the brain are flattened, the sulci filled with opaque looking sub-arachnoid fluid. The vessels are injected, otherwise nothing abnormal.

Remarks.—This is an ordinary case of sleeping sickness. The anæmia may have been helped by the ankylostomata. The pericarditis is an uncommon feature.

CASE 23.—Budara (Male). Age 22 years. Occupation, Kitchen Boy. District, near Kampala.

Admitted February 26, 1903, to hospital complaining of weakness. He has a dull look and tremors of the tongue and hands. States he has been ill about a month.

April 8. *General Condition.*—He is thin and poorly nourished. His gait is feeble. He is very slow and lethargic in his movements, and his face is dull and expressionless. There is no œdema of any part. The colour of his mucous membranes is normal. Lymphatic glands generally enlarged (the size of beans). He does not complain of any pain, and there are no cutaneous eruptions.

Nervous System.—His intelligence is dull and he sleeps a good deal. His speech is slow, but distinct, and very weak, not being raised above a whisper. His vision and the movements of his eyes appear to be normal. He has marked tremor of the tongue, but not of the lips or hands. His knee-jerk is absent, and ankle clonus is not present.

Alimentary System.—His tongue is moist and slightly furred, and his lips are dry. Neither liver nor spleen is enlarged.

Circulatory System.—The heart's impulse is not visible or palpable. On auscultation the sounds are weak, but normal. The pulse is 70 per minute, with a low tension, small in size, easily compressible and rhythm regular.

Respiratory System.—Nothing noteworthy.

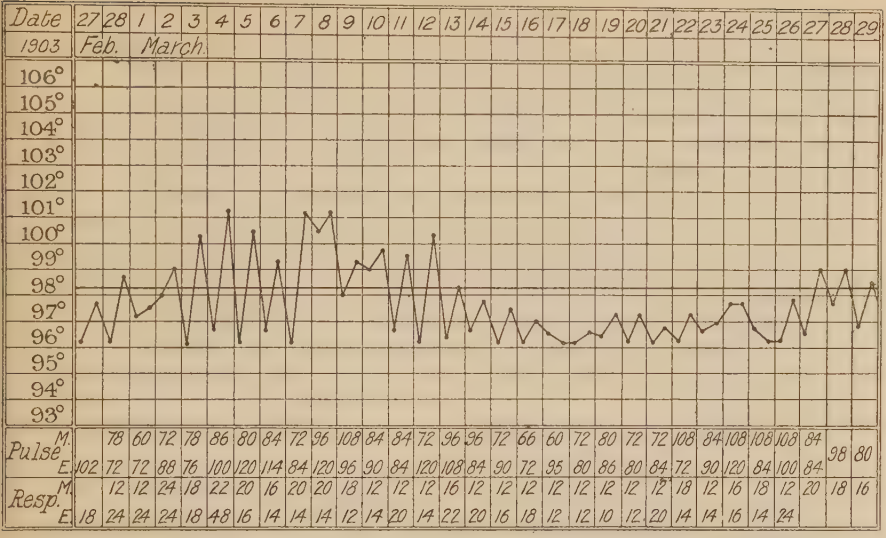
Urinary System.—Nothing noted.

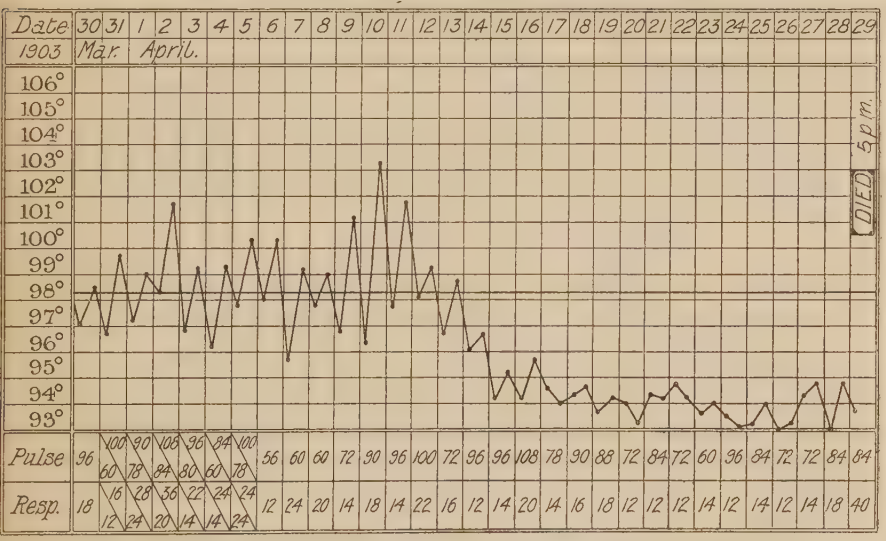
Skin.—Over the legs and forearms it is scaly, rough, and dry.

The following chart (p. 51) represents the course of the disease.

The following table shows the absence or presence of trypanosoma in the blood and cerebro-spinal fluid :—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Mar. 26....				−	+
Apr. 8....	−	−	−		
,, 18....	+	−	+		
,, 22....		−			





April 25, 1903. During the past few days the patient's temperature has been constantly below 95° F. and his body feels cold to the hand. He is becoming much more apathetic, and his eyes are half closed.

April 27, 1903. Patient is now practically dying. His eyes are nearly closed and he does not respond when spoken to. He takes milk with difficulty.

April 29, 1903. He had an epileptiform seizure at noon. Blood taken for examination was very dark and venous. Died at 5 P.M.

April 30, 1903. *Post-mortem* 16½ hours after death.

Rigor mortis is present. There are no bed sores. The pupils are equal. The body is that of a thin, but well nourished, man of 20.

General.—On opening the body no fluid is found in the peritoneal or pleural cavities. There is a small amount of clear straw-coloured fluid in the pericardium.

Heart.—Weight 8 oz. On the anterior surface of the heart over the right ventricle there were several well-marked petechiæ, and this condition was also found in the endocardium, especially in the left ventricle. Otherwise the heart is normal.

Lungs.—Right weighed 7 oz. On section it was congested.
Left weighed 7 oz. On section it was fairly normal.

Liver.—Weight 3 lb. 12 oz. On section there was some fatty degeneration.

Spleen.—Weight 8 oz. On section it was slightly pigmented, and there is an excess of fibrous tissue.

Kidneys.—Both weighed 2½ oz. The capsules stripped off readily.

Pancreas.—Nothing noteworthy.

Intestines.—The mesenteric glands are all enlarged.

Brain.—This is an ordinary typical sleeping-sickness brain with flattened convolutions, excess of sub-arachnoid fluid giving the surface an opaque, glassy appearance. There is an excess of fluid in the ventricles, otherwise nothing abnormal can be seen by the naked eye.

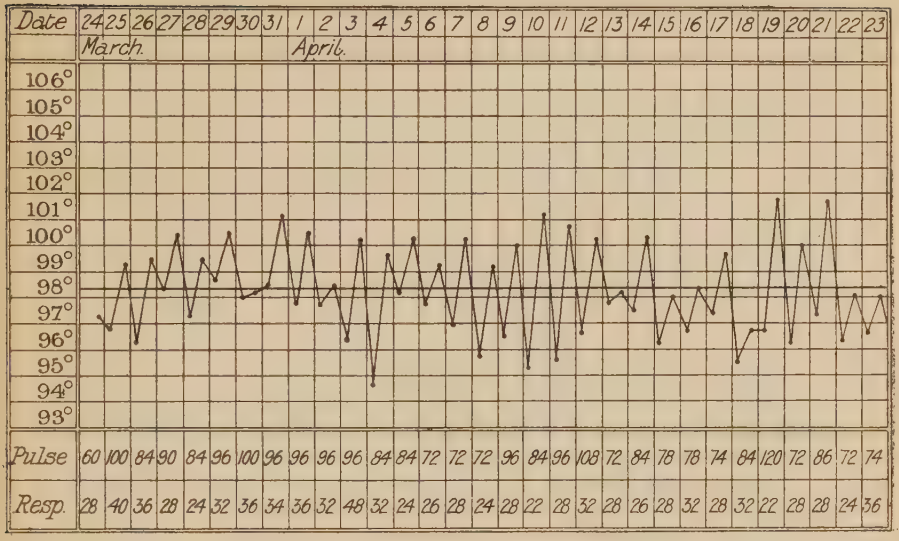
Remarks.—This is an ordinary uncomplicated case of sleeping sickness. During the last day or two of life he had convulsive seizures, in one of which he died.

Case 18.—Kavera (Male). Age 52 years. Control. District, Bussi. Occupation, Fisherman. Food, Bananas, Fish, and Sweet Potatoes.

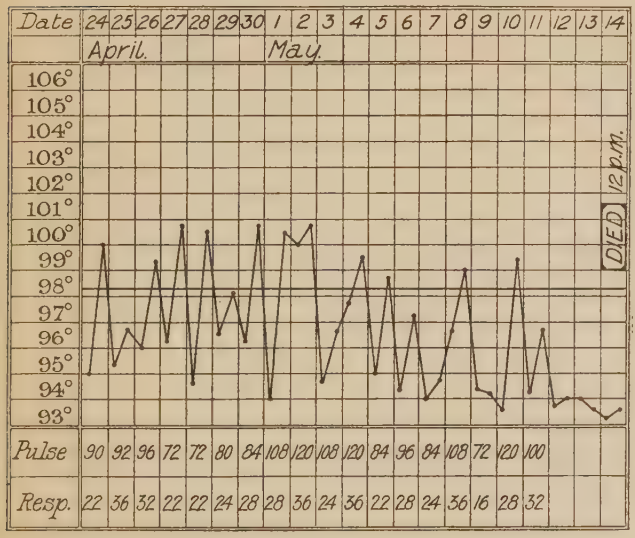
March 24, 1903. Admitted to hospital as a case of sleeping sickness. He is an old man, bent double with rheumatism, and has a large ischio-rectal abscess. States he has been ill 3 months, the first symptoms being pain in the back. There had been no cases of sleeping sickness in the same house.

May 13. Died.

The following chart represents the course of the disease :—



Date	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	March.								April.																						
Pulse	60	100	84	90	84	96	100	96	96	96	96	84	84	72	72	72	96	84	96	108	72	84	78	78	74	84	120	72	86	72	74
Resp.	28	40	36	28	24	32	36	34	36	32	48	32	24	26	28	24	28	22	28	32	28	26	28	32	28	32	22	28	28	24	36



Date	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	April.							May.													
Pulse	90	92	96	72	72	80	84	108	120	108	120	84	96	84	108	72	120	100			
Resp.	22	36	32	22	22	24	28	28	36	24	36	22	28	24	36	16	28	32			

The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid :—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Apr. 6....					–
„ 22....		–			

May 14. *Post-mortem* 9 hours after death.

Rigor mortis passing off. There is a superficial bed sore over sacrum. The body is extremely emaciated, the right testicle enlarged, and there is a large fistula in the ischio-rectal region.

Heart.—The wall of the right ventricle is thinned; the muscular tissue of the left dark in colour, tough and fibrous.

Lungs.—Healthy.

Liver.—Weight 2 lb. 5 oz. Small on section, slate-coloured and tough.

Spleen.—Universally adherent. Weighed 4 oz. There is a small tumour, the size of a kidney bean in the substance, probably secondary.

Kidneys.—Left weighs 3 oz. Capsule strips readily, substance normal.

Right weighs $2\frac{1}{2}$ oz. Capsule strips readily, substance normal.

Alimentary System.—Lymphatic glands enlarged. A small tumour the size of a walnut attached to mesentery. Abscess in right testicle, probably communicating with fistulous opening near anus.

Remarks.—There was no reason at any time to suppose that this was a case of sleeping sickness. His case is given as a control. He also, like Case 26, Zenabu, was for 2 months in close contact with sleeping sickness cases without contracting the disease.

Case 26.—Zenabu (Female). Age 18 years. Control. No appreciable disease. District, Budu. Food, Sweet Potatoes.

February 27, 1903. Admitted to hospital as a case of sleeping sickness. States the first symptom was headache; has never been drowsy.

March 30. Case taken. There was nothing definite, headache and amenorrhœa. She has been ill 3 months.

General Condition.—Development and nutrition good. Gait normal, but she lies about a good deal. She is fairly intelligent, but the expression of her face is somewhat dull. There is no œdematous swelling in any part of her body. She is somewhat anæmic. Her lymphatic glands are generally enlarged (size of peas). She complains of pain in the back of her neck. Her breathing is normal, 16 per minute. Her pulse 96 per minute and her temperature 98·8. There is a papulo-vesicular eruption, evidently due to itch, in the dorsum of both hands and on arms and forearms.

Nervous System.—Her intelligence and memory seem normal, her sleep and speech also normal. Her eyes present nothing noteworthy. She has no tremors of tongue, lips, or hands, her left knee-jerk is increased, the right is normal; no ankle clonus.

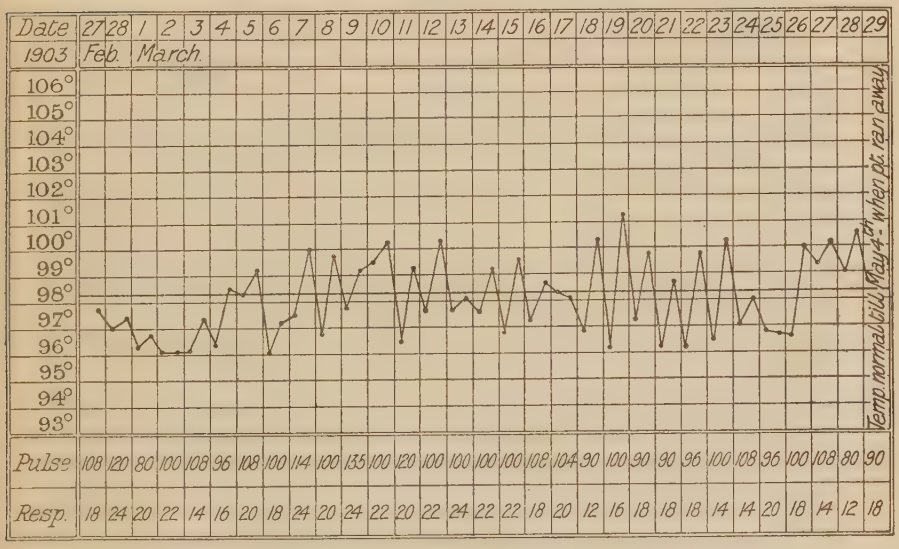
Liver and Spleen.—Not markedly enlarged.

Heart.—The heart impulse is feeble and is not easily felt, but the sounds are normal in character. The pulse has a rate of 96, a fair tension, small in size, normal in compressibility, and regular in rhythm.

Eyes.—On ophthalmoscopic examination her eyes were found to be normal.

May 4. Ran away.

The following chart represents the course of the disease :—



The temperature remained normal from March 29th to May 4th, when patient ran away.

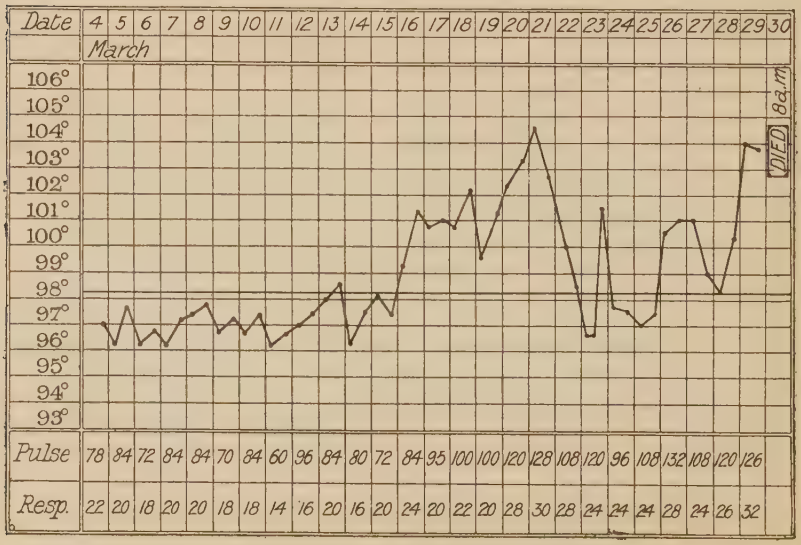
The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid :—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Apr. 9....	+	−	−		
,, 13....				+	−
,, 22....		−			

Remarks.—This is no case of sleeping sickness. It was intended to send her home in a few days. She was in the Sleeping Sickness Hospital for more than 2 months, in close contact with the patients, without being affected. This would go to show that lice and fleas do not convey the disease, as these insects were numerous in the hospital when we arrived here.

Case 12.—Ibraham (Male). Age 20 years.

March 4, 1903. Admitted to hospital.
March 30. Died.
The following chart represents the course of the disease :—



Post-mortem 1½ hours after death.

Rigor mortis absent. There is a large bed sore over the sacrum. Lymphatic glands of the groin are enlarged. An abscess was found in the region of the third, fourth, and fifth lumbar vertebræ. Probably caused by the bed sore.

Brain.—Dura mater non-adherent, normal. The vessels on the surface of the brain are injected. Sub-arachnoid fluid in excess, giving a dull glassy œdematous look, similar to Case 11, but not quite so well marked.

Heart.—There is some yellow œdematous material about the base. The interior is normal. Aorta healthy.

Lungs.—Area of collapse at base of right, otherwise healthy.

Liver.—Large, somewhat pigmented, marked fatty degeneration.

Spleen.—Very large, pigmented, substance softened, almost diffluent.

Kidneys.—Normal. *Pancreas*, healthy.

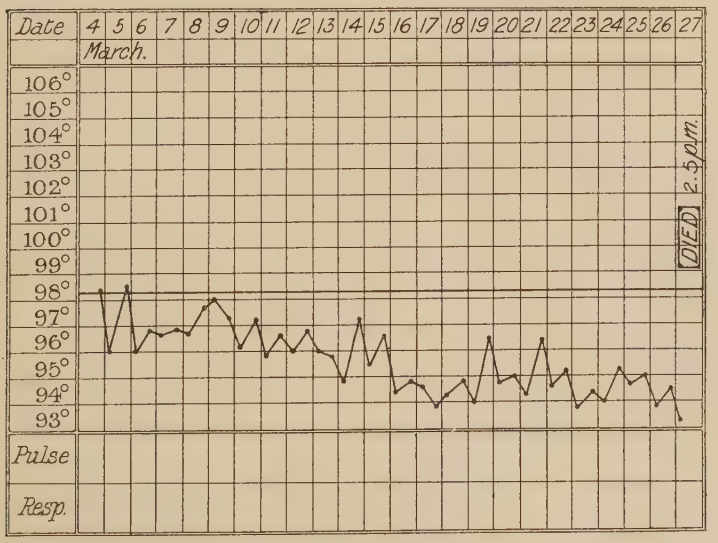
Intestines.—Mesenteric glands enlarged. No ankylostomata.

CASE 10.—Ibsasara (Male). Age about 35.

March 5. Admitted to hospital.

March 27. Died at 2 P.M.

The following chart represents the temperature curve :—



Post-mortem ½ hour after death.

Rigor mortis absent. Large bed sore over sacrum. Body extremely

emaciated, reduced to skin and bone. There was no excess of fluid in the pericardium, pleural or peritoneal cavities.

On removing the calvarium a large quantity of blood escaped, it not having as yet clotted. The dura mater was not adherent to the brain, nor did it appear in any way abnormal.

On reflecting the dura mater the brain was found to have an abnormal appearance. The small vessels on the surface were injected, the pia mater was opaque, and the sub-arachnoid fluid much in excess, giving the exposed surface of the brain a dull glassy appearance.

The organs generally were healthy.

Spleen.—Was normal in size, but deeply pigmented and tough.

Liver.—Was small, dark chocolate in colour, and somewhat firmer than usual.

Heart.—Was healthy.

Lungs.—Were fairly normal, except for a patch of congestion and œdema in the superior lobe of the right lung.

Kidneys.—Appeared healthy.

Large Intestine.—Was packed full of masses of hard fæces.

Remarks.—This case shows the tendency to obstinate constipation towards the end of the disease.

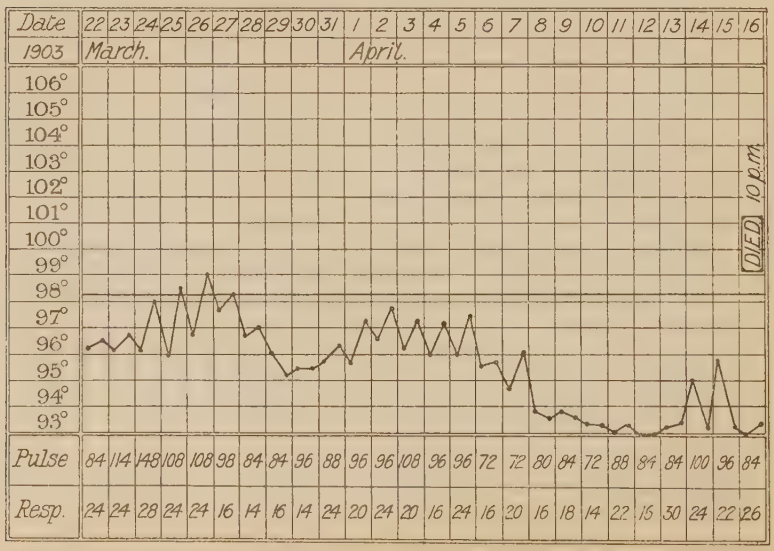
Case 39.—Zakibu (Male). Age 20.

March 22, 1903. Admitted to hospital. Patient has a tottering gait. His glands are enlarged, temperature normal, and no tremors.

April 14. General convulsions.

April 16. Died 10 P.M. Left facial palsy before death.

The following chart represents the course of the disease :—



The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid :—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Apr. 6.....					+

April 17. *Post-mortem*, 9.30 P.M., 11½ hours after death.

The body is that of a well-nourished young man. Rigor mortis is present. There is a superficial bed sore over the right hip, and a bulla over the front of left thigh. Right pupil somewhat larger than the left.

Heart.—Normal in size. Valves and muscular substance healthy, no petechiæ.

Lungs.—Right. Nearly the whole of the upper lobe and upper half of the lower lobe is consolidated. The middle lobe is normal. On section the above-named parts are found to be in a condition of red hepatisation.

Left. This lung is firmly adherent to the diaphragm by old adhesions. No fluid in either pleural cavity. The lower lobe is deeply congested.

Spleen.—Much enlarged and adherent to surrounding structures. On removing it, it is found to be distorted in shape, due to a mass of cicatricial tissue which has become calcareous, evidently the site of an old infarct. The substance is dark, pigmented, and tough.

Liver.—Large, capsule smooth. On section slightly pigmented, otherwise nothing noteworthy.

Kidneys.—Healthy. *Intestines.*—Healthy. Some worms in the upper part of small intestine.

Scalp.—A patch of œdematous yellow jelly-like material.

Brain.—On removing the calvarium the dura mater is found to be healthy in appearance.

The surface of the brain is injected and the sub-arachnoid fluid in excess and dull and opaque in character. There are no signs of active or acute meningitis. The substance of the brain appears healthy to the normal eye.

Remarks.—This case ended in pneumonia with a pneumococcus invasion of the blood.

Case 40.—Matasa (Male). Age 24 years. District, Bussi. Occupation, Bark-cloth Maker. Food, Bananas and Sweet Potatoes, no Fish.

March 24. Admitted to hospital; facies dull, stares vacantly; gait somewhat weak; knee-jerks feeble; pulse fair, 100; tremor of lips and fingers. He states that no other cases of sleeping sickness had occurred in the same house. Had been ill about 2 months, the first symptoms being pain in the head and chest, then he slept too much.

April 15, 1903. *General Condition.*—He is well nourished, has a weak and staggering gait, is slow, and the expression of his face is dull and vacant. There are no œdematous swellings or trophic changes. The lymphatic glands are enlarged, especially in the inguinal and femoral regions (the size of beans). He complains of headache, his pulse is 102 standing up, temperature 99·8, and there are no cutaneous eruptions.

Nervous System.—His intelligence and memory are fair; he is always lying in bed in a drowsy condition. His speech is slow and mumbling. His eyes are normal. There is a marked tremor of tongue, lips, hands, and generally of the body. Sensibility to touch is normal. In regard to the reflexes, knee-jerk is present, ankle clonus absent.

Alimentary System.—His appetite is good, his tongue is moist and furred, his liver is not enlarged, his spleen is not palpable.

Circulatory System.—Heart sounds are normal. Pulse 132, tension low, size small, compressibility easy, rhythm slightly irregular.

Respiratory System.—Nothing abnormal.

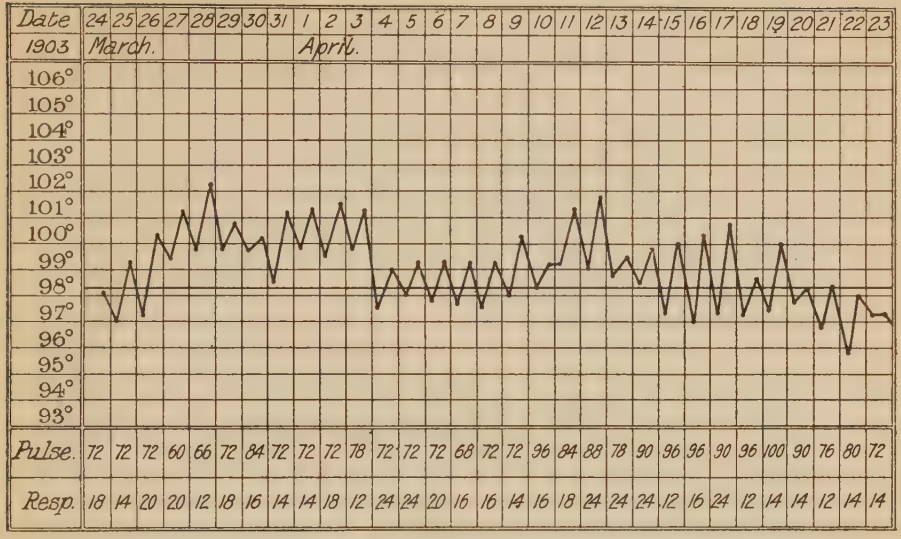
Skin.—The skin of the legs is scaly and dry.

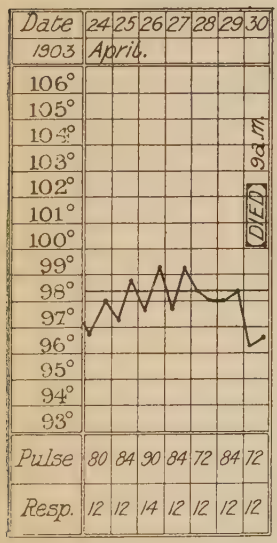
April 30. Died at 9 P.M.

The following chart (p. 61) represents the course of the disease:—

The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid:—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Mar. 29....					−
Apr. 2....					−
,, 13....					−
,, 20....	+		+		+
,, 22....		−			





May 1, 1903. *Post-mortem*, 9 A.M., 12 hours after death.

The body is that of a well-nourished young man. Rigor mortis is present. There are no bed sores. The pupils are equal and normal. The lymphatic glands are enlarged and the abdomen distended.

General Condition.—On opening the body no fluid is found in the peritoneal or pleural cavities. There is a small quantity of clear straw-

coloured fluid in the pericardium. The coils of the intestine are much distended, as also is the bladder with urine.

Circulatory System: Heart.—Has an excess of fat. There are a few minute petechiæ seen. Otherwise the heart and its structures appear fairly healthy.

Respiratory System: Lungs.—Both lungs are congested. There are no signs of pneumonia.

Liver.—Weighs 4 lb. Deep dusky red on section, is congested and contains a large quantity of dark blood.

Spleen.—Weighs 12 oz. Is enlarged, the capsule being much thickened and adherent. On section the splenic tissue is pigmented and there is an excess of fibrous tissue.

Kidneys.—The capsule strips off readily. On section both are highly congested. *Mesenteric Glands.*—Are enlarged.

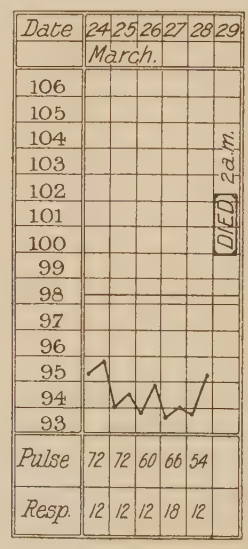
Brain.—On removing the dura mater the vessels of the surface of the brain are seen to be intensely injected with blood. The convolutions are flattened and the surface has a dry look. The sulci are mostly obliterated and no excess of sub-arachnoid fluid is seen. On section there is nothing found abnormal in the naked-eye appearances.

Remarks.—This was a good typical case of sleeping sickness.

Case 11.—Goavera (Female). Age 40 years.

March 24. Admitted to hospital. Died on the 29th.

The following chart represents the temperature:—



Post-mortem 9 hours after death.

Rigor mortis absent. A small superficial bed sore over left hip. Body extremely emaciated. Enlarged glands (femoral, inguinal, cervical, and posterior occipital).

Brain.—Dura mater non-adherent. No change. The vessels are much injected, the sub-arachnoid fluid is greatly in excess, giving opaque glassy look to the surface of the brain, especially over the sulci. Fluid aspirated from the lateral ventricles slightly cloudy.

Cord.—Nothing noteworthy.

Heart.—Small and flabby. A quantity of deep yellow œdematous jelly-like material at base of heart. Otherwise the heart is normal.

Lungs.—Normal.

Liver.—Is adherent to the diaphragm, dark in colour, probably due to pigment, but otherwise fairly healthy.

Spleen.—Universally adherent and enlarged. On section the splenic substance is slightly pigmented, some excess of fibrous tissue and the pulp rather softer and more friable than normal.

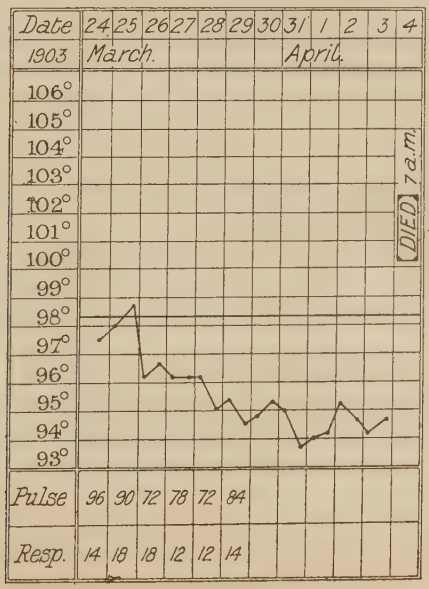
Kidneys.—Capsule strips off readily. Substance on section fairly healthy.

Intestines.—Large intestine packed with large scybala. Small intestine: many ankylostomata.

Case 17.—Nabujam (Female). Age 30 years. Control. Cerebral Tumour.

March 24, 1903. Admitted to hospital as a case of sleeping sickness.

March 31. Case taken. The patient was suffering from hemiplegia.



Diagnosis.—Cerebral tumour.

The preceding chart (p. 63) represents the course of the disease.

The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid:—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Mar. 31....	+	–	–		
Apr. 1....					–
„ 2....					–
„ 4....					–

April 4. Died at 7 A.M. *Post-mortem*, 9 A.M., 2 hours after death. Rigor mortis absent. Body fairly well nourished.

Brain.—On removing the dura mater the small vessels on the surface of the brain were found to be injected. The sub-arachnoid fluid was slightly in excess and appeared dull and opaque. This appearance was not marked as in some former cases, and in fact did not present any very special feature.

There was a large quantity (10 c.c.) of clear fluid in each lateral ventricle. On removing the brain and examining the base, extensive disease was seen in the inter-peduncular region involving the optic chiasma and nerves and floor of the third ventricle. On examining more closely the left hemisphere, this condition was found to be connected with an area of softening and infiltration of the brain substance with a yellow gelatinous gliomatous-like tumour, probably syphilitic in origin.

Heart.—Normal.

Liver.—Small in size and irregular in shape, due to cicatricial tissue, evidently the site of an old gumma.

Spleen.—Normal in size. Adherent to diaphragm. Not pigmented and fairly healthy.

Kidneys.—Capsules rather adherent, kidney substance looked normal to the naked eye.

Urine.—10 c.c. centrifuged. Red blood corpuscles, white blood corpuscles, epithelial cells, granular casts, but no parasites or ova.

Remarks.—This was not a case of sleeping sickness at all, but a tumour of the brain.

CASE 24.—Yakubu (Male). Age 12 years.

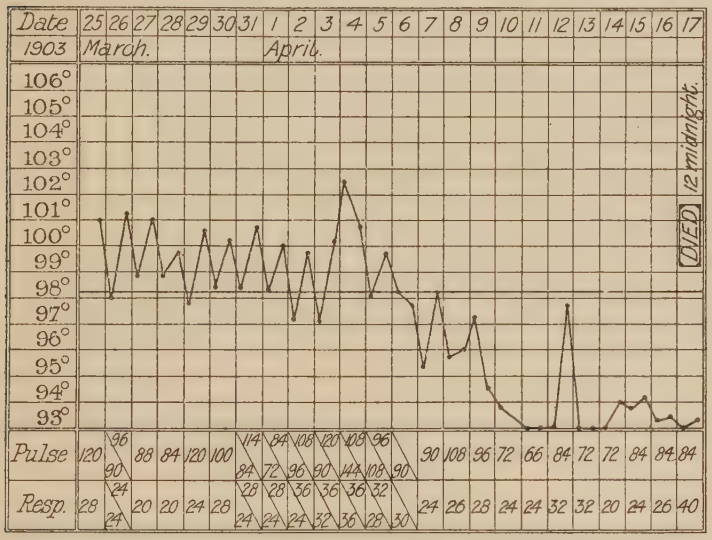
March 25, 1903. Admitted to hospital.

March 27, 1903. 10 c.c. of cerebro-spinal fluid were taken by lumbar puncture, and trypanosomes were found to be numerous in the sediment.

April 7. To-day the patient appears heavy, dull-eyed, and has a discharge from the nose.

April 17. Patient has had convulsions for several days. He died at 12 P.M.

The following chart represents the course of the disease:—



The following table shows the presence or absence of trypanosoma in the cerebro-spinal fluid and in the blood:—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903. Mar. 23....					+

April 18. *Post-mortem* 9 A.M.

The body is well nourished. Rigor mortis is present. There are no bed sores. The left pupil is a little larger than the right.

Heart.—There is an increase of fat about the base of the heart. There is no jelly-like deposit and no petechiæ in the endocardium. The heart substance and valves are normal.

Lungs.—There is no fluid in either plural cavity.

Right. Lymphatic glands at the root of the lung are enlarged, otherwise this lung is healthy.

Left. Deep congestion of the posterior part of the upper lobe, and the whole of the lower lobe.

Spleen.—Is enlarged, and on section is pigmented and tough.

Liver.—Somewhat enlarged, congested, and with fatty degeneration.

Kidneys.—Both healthy.

Intestines.—There is no fluid in the peritoneal cavity. The mesentery especially between the transverse colon and the duodenum is spotted over with white patches varying from a pin's head to a pea. On section there is no feeling of cutting through calcareous deposit.

The mesenteric glands are enlarged to the size of a large bean. (Ankylostomata (6 or 7) were found in the jejunum.)

Brain.—The surface is injected and the sub-arachnoid fluid is in excess, giving the sulci a cloudy ground-glass appearance. On section the naked-eye appearances are normal.

Remarks.—There is nothing much to be remarked in this case. The temperature chart shows the usual fall before death. Trypanosomes were found in the cerebro-spinal fluid before death, and a streptococcus was obtained from the heart's blood and lateral ventricles after death.

Case 25.—Kimbra (Male). Age 30. Occupation, Wood-cutter. District, Bussi. Food, Fish, Bananas, and Sweet Potatoes.

March 25, 1903. Admitted to hospital.

April 6. Patient has a weak tottering gait, is heavy and dull-eyed. His tongue is tremulous. His speech is a far-away, high-pitched, indistinct monotone. His lips are dry and cracked, and he passes urine involuntarily.

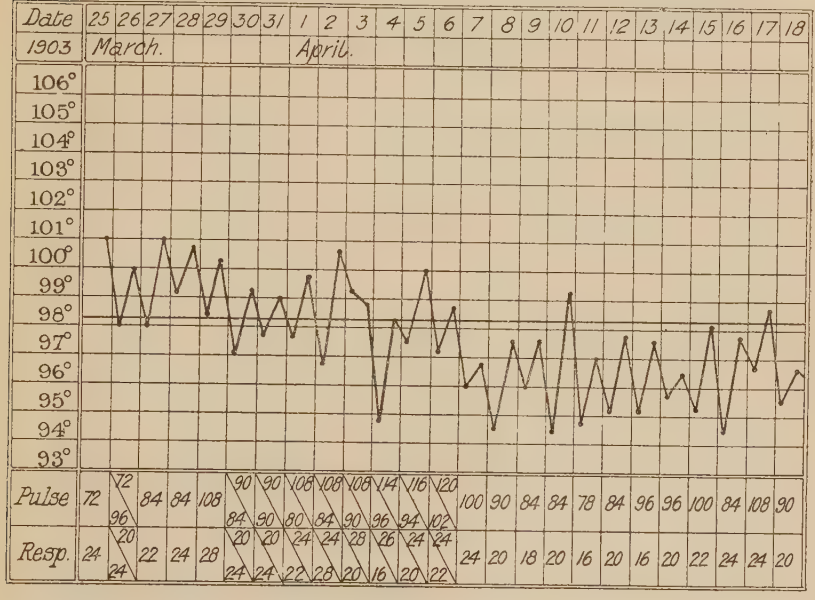
He states he has been ill 7 months, and that a brother died of sleeping sickness in the same house.

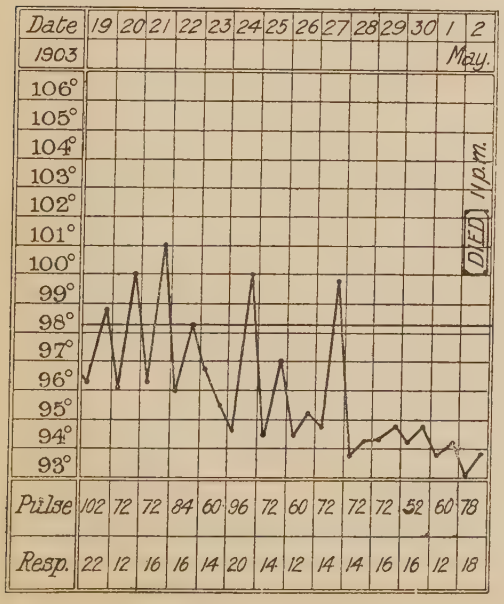
April 22. *General Condition.*—He is well nourished. His gait is weak and tottering, and he can hardly walk without assistance. He is fairly intelligent. The expression of his face is heavy, sad, and dull. There is no œdema of any part. The colour of the mucous membrane is normal. There are no trophic changes. The lymphatic glands are generally enlarged.

Nervous System.—His intelligence and memory are fair. He sleeps much during the day. His eyes are normal. He has marked tremor of his tongue, but none of lips or hands. Knee-jerks are present; no ankle clonus.

Alimentary System.—His appetite is good, and his tongue is moist and furred. The liver and spleen are not enlarged. He requires medicine every two or three days to move his bowels.

Circulatory System.—Heart sounds weak, but normal, apex beat





imperceptible. Pulse 90, tension fair. Size medium, compressible, and regular.

Respiratory System.—Normal.

Cutaneous System.—His skin is normal and there are no eruptions.

The preceding chart (p. 67) shows the course of the disease.

The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid :—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Mar. 26....				−	+
Apr. 20....	+		+		
„ 22....		−			

May 3. *Post-mortem* 11 hours after death.

The body is that of a well-nourished, powerful, muscular young man. Rigor mortis is absent. There are no bed sores and the skin is smooth and healthy. The pupils are equal and normal. The superficial lymphatics are enlarged (the size of beans).

On opening the body, no fluid is found in the peritoneal cavity, nor in either pleural cavity. A small quantity of clear straw-coloured serum is in the pericardium.

Left Lung.—Weighs 12 oz., and is normal.

Right Lung.—Weighs 16 oz., and is slightly congested, otherwise normal.

Heart.—There is excess of fat about the base of the heart. The muscular substance is somewhat pale, but healthy, and the valves are normal. There are some petechiæ on the pericardium on the outside of the left ventricle, but none on the endocardium. Weight 9 oz.

Spleen.—Weighs 8 oz. Is universally adherent, and the capsule is thickened and contracted in places, giving the organ a lobed appearance. On section there is an excess of fibrous tissue, and some pigmentation.

Liver.—Weighs 3 lb. 6 oz. The capsule is somewhat thickened and is adherent to some of the underlying structures.

On section there is advanced fatty degeneration.

Kidneys.—Each weighs 4 oz. The capsules strip off easily, the organ is healthy.

Brain.—The vessels on the surface are deeply injected. The sub-arachnoid fluid in excess. The convolutions are flattened. There is a great excess of fluid in the lateral ventricles, otherwise there is nothing abnormal to the naked eye.

Alimentary System.—The mesenteric glands are enlarged. The whole of the large intestine is packed full of hard scybala.

Remarks.—This is an ordinary case of sleeping sickness.

CASE 22.—Zebuganza (Male). Age 40 years. District, Entebbe. Food, Sweet Potatoes and Bananas.

March 25, 1903. Admitted to hospital.

April 7. His gait is weak, he has a heavy look, and his speech is indistinct and weak. There are no marked tremors. He states that he has been ill 2 months.

April 22. *General Condition.*—Patient is poorly nourished. There is slight dementia. His gait is weak and staggering, and the expression on his face is vacant. There is no œdema anywhere. The mucous membrane is normal, and there are no trophic changes. Supra-condylar, inguinal, submental and the glands in the posterior triangle of the neck are enlarged. He complains of pain in the back and head.

Nervous System.—His intelligence and memory are impaired. He lies about and sleeps all day. His speech is indistinct and mumbling. His eyes are normal. The tongue is moist and tremulous. There are tremors of the lips and hands and general muscular tremors. The knee-jerk is present, ankle clonus absent.

Alimentary System.—His appetite is poor. Stomatitis is present. The liver and spleen are not enlarged.

Circulatory System.—Heart sounds are normal, but feebly heard owing to emphysema, there is no bruit. The pulse is 88, feeble, no tension, irregular in force and regular in rhythm.

Respiratory System.—Emphysema in both lungs.

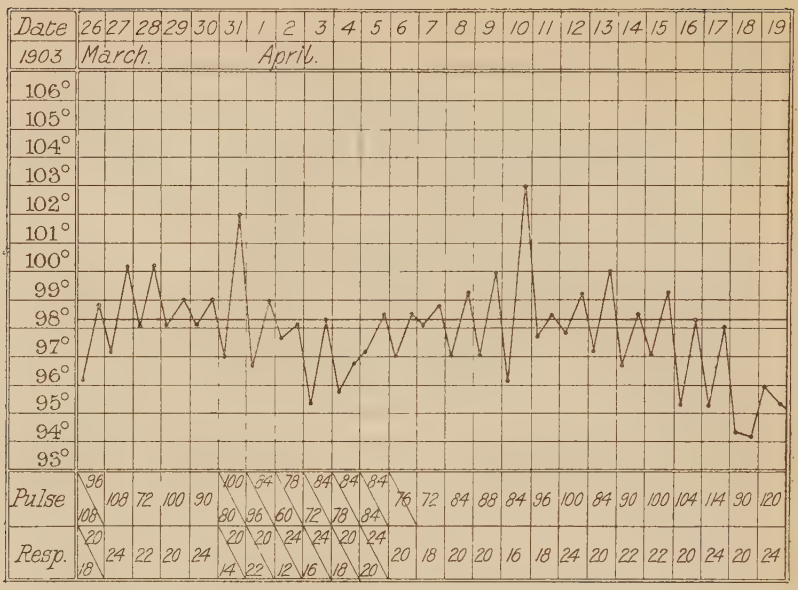
Skin.—Is dry and slightly scaly.

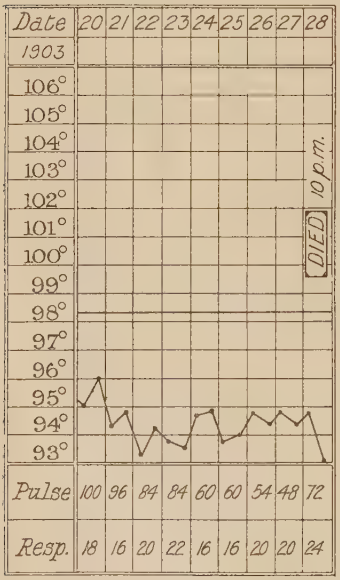
The following chart (p. 70) represents the course of the disease.

The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid :—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Mar. 27....				−	+
Apr. 18....			+		
,, 22 ...		−	+		
,, 29*...	+	−	−		

* Blood taken 15 hours after death.





April 29. *Post-mortem* 11½ hours after death.

The body is that of an elderly man, apparently 40 or 50 years of age. Rigor mortis is present. There are no bed sores. The abdominal region is retracted, the body is thin, but not emaciated. The pupils

are equal and normal. The inner aspect of the lips is ulcerated. The superficial lymphatic glands are slightly enlarged.

On making an incision from the chin to the pubes, no fluid is found in the peritoneal cavity. The spleen is somewhat enlarged, the bladder is distended with urine, the mesenteric glands are enlarged to the size of a bean, and the descending colon contains some hard fæces. On removing the sternum, both lungs are found to be adherent to the thorax by old tough adhesions. There is no fluid in either pleural cavity. There is half-an-ounce of clear straw-coloured serum in the pericardium.

Heart.—Is normal in size, flabby in consistence, and there is a slight increase of fat at the base. The muscular substance of the wall of the left ventricle appears fairly healthy. The aortic and mitral valves are normal. The right ventricle contains a large pale-coloured clot. The pulmonary and tricuspid valves are healthy. There are no signs of petechiæ at any part of the endocardium. A slight thickening is seen at the attachment of the valves of the aorta. The heart weighs 8 oz.

Lungs.—Left lung weighs 8 oz. There is some emphysema along the anterior border of the apex. On section the lung tissue is fairly healthy. The lymphatic glands at the root of the lung are enlarged and pigmented.

Right lung weighs 16½ oz. There is emphysema along the anterior margin and at the apex, the lower lobe is deeply congested. Large quantities of frothy fluid exude on pressure. The upper lobe is also congested, but to a less extent.

Spleen.—Weighs 6 oz. It is slightly enlarged. On section the substance is slightly pigmented and is fairly normal in consistence.

Kidneys.—Left weighs 4 oz. The capsule strips off readily. On section there is slight congestion, otherwise healthy.

Right, weighs 2½ oz., condition same as left.

Liver.—Weighs 2 lb. 12 oz. The capsule is smooth and somewhat dark in colour. On section the substance of the liver is found to be slightly pigmented, and there is fatty degeneration.

Brain.—On removing the calvarium the dura mater is found to be healthy. The vessels of the surface are injected and the convolutions are flattened. The sub-arachnoid fluid is in excess, distending the sulci and giving them the opaque ground-glass appearance. On section the substance appears fairly healthy. There is a quantity of fluid in the lateral ventricles. The brain is firm in consistence, and nothing further of importance was found.

Remarks.—This is an ordinary uncomplicated case of sleeping sickness, which probably lasted 3 months.

Case 41.—Warasansa (Male). Age 32. District, Bussi. Occupation, Bark-cloth Maker. Food, principally Sweet Potatoes.

March 25, 1903. Admitted to hospital. He states that none of his family have died of sleeping sickness, and no other cases have occurred in his house. He thinks the illness began about three months ago, the first symptoms being headache and a tendency to sleep.

April 6. His gait is undecided and weak, pulse 132.

April 28. *General Condition.*—He is fairly well nourished, he is up and about, but his gait is weak and staggering. His intelligence seems good. The expression of his face is wistful. There is slight general enlargement of the lymphatic glands.

Nervous System.—His intelligence is good, and memory fair. He sleeps a good deal during the day. His speech is rather weak and monotonous, but distinct. He has a jerky tremor of the tongue, but not of lips or hands. The knee reflexes are present.

Alimentary System.—Tongue moist, covered with white fur. His liver is normal, but his spleen is palpable.

Circulatory System.—The impulse of the heart is neither visible nor palpable. Heart sounds are normal. No bruit. Pulse is 80 per minute, size fair, tension moderate, regular.

Cutaneous System.—Scaly eruption on upper part of chest.

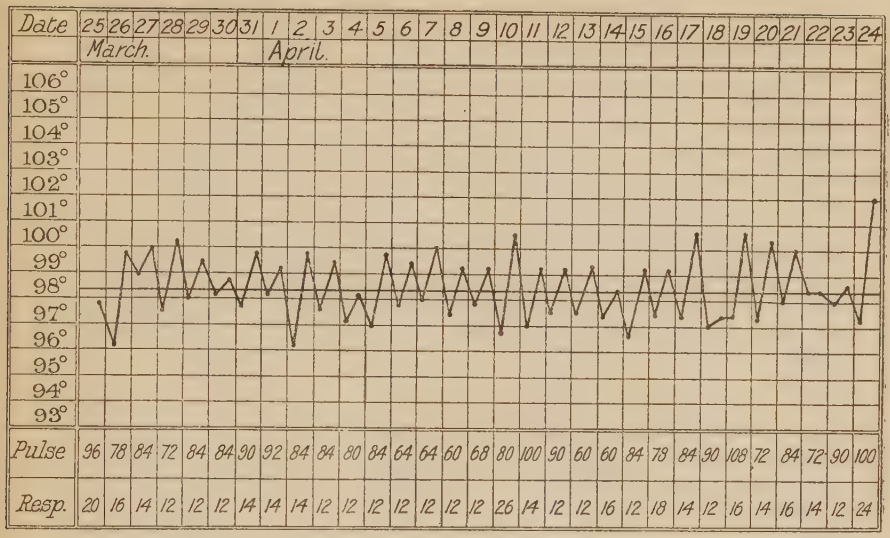
May 13. During the past week patient has become considerably worse. He passes his motions under him. His temperature is almost constantly below 96° F. On the 11th inst. 50 c.c. of fluid was obtained by lumbar puncture. This morning there is a staring vacant expression of the face and the upper eyelids are retracted. Patient is unable to stand. There is a painful swelling of the lymphatic glands of the right femoral and inguinal region. There is no fluctuation. Nothing external can be seen to account for this inflammation. There is no chancre, nor wound of any kind of leg or foot. After death these inflamed glands were found to be breaking down into pus.

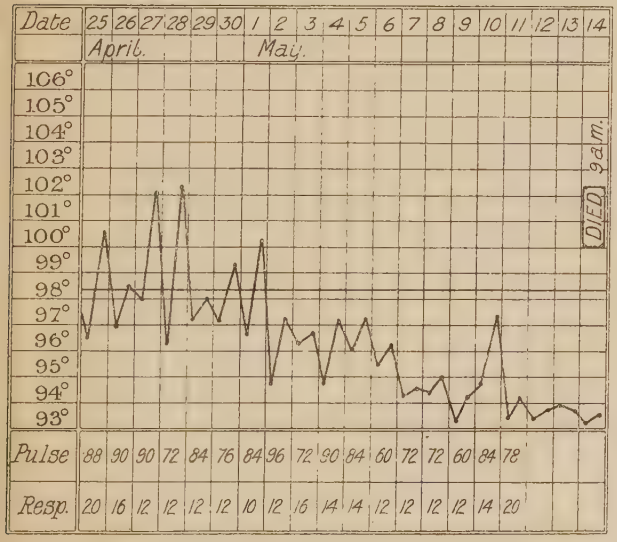
May 14. Died at 9 A.M. No *post-mortem*.

The following chart (p. 73) represents the course of the disease.

The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid:—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Apr. 6....					−
„ 12....	+		−		
„ 19....		−			
„ 22....	+	−	+		
May 11....					+





Remarks.—This case resembles Case 35 (Fatoma), in the acute inflammation of lymphatic glands which at death are found to be suppurating. Whether this is due to the disease or to some coincident cause it is difficult to say. Except for this it is a simple uncomplicated case of sleeping sickness.

Case 37.—Kiagabidoia (Male). Age 50 years. District, Bussi. Occupation, Fisherman. Food, Fish, Bananas, and Sweet Potatoes.

March 25, 1903. Admitted to hospital. He states he has been ill more than two months. There had not been any other cases of sleeping sickness in the same house.

April 15. *General Condition.*—Development and nutrition poor. Gait unsteady and weak, but not very typical. Intelligence fair. Expression of face dull, but not characteristic of sleeping sickness. No œdema. Glands generally enlarged. Complains of pain in thighs, but no headache. Pulse 74. No cutaneous eruptions.

Nervous System.—Intelligence and memory fair. Sleep not excessive. Speech normal. Eyes normal. Tongue jerky. Knee-jerk present. Ankle clonus absent.

Alimentary System.—Appetite good. Tongue moist and furred. Liver and spleen not enlarged.

Circulatory System.—Impulse of heart cannot be felt. Sounds normal.

Skin.—Scaly on legs.

May 4. Tongue still tremulous. Marked tremor of hands. His speech is weak and monotonous. He is reported as not sleeping during the day.

May 6. He is becoming very feeble and tremulous.

May 20. There is right facial paralysis to-day. He cannot walk now.

May 22. Died at 11 P.M.

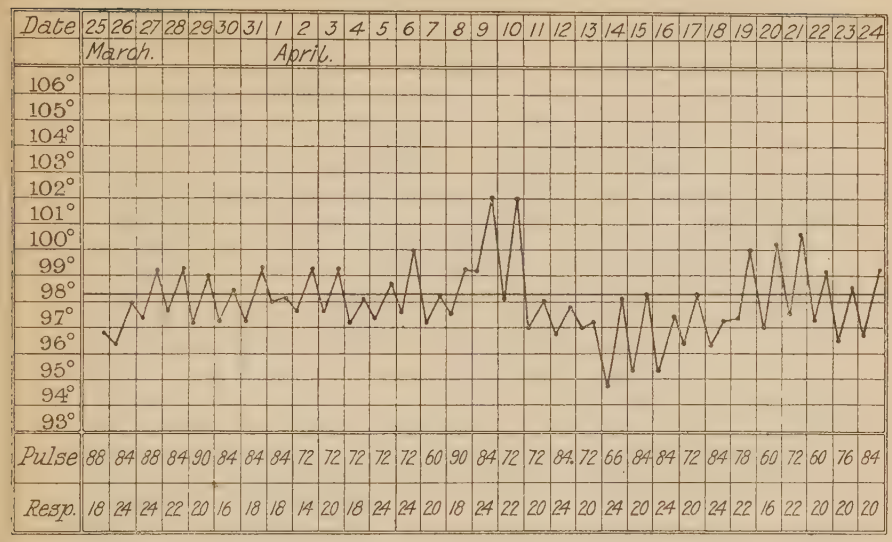
The following chart (p. 75) represents the course of the disease.

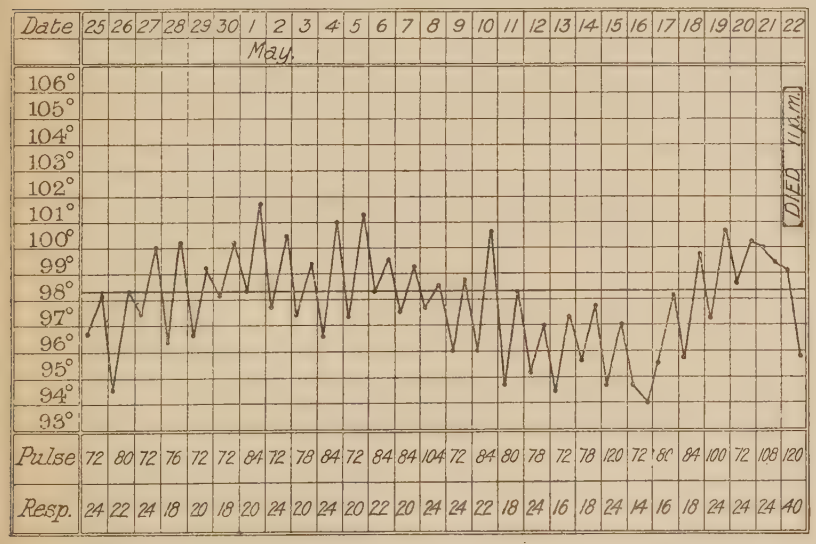
The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid:—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Mar. 28....					–
Apr. 1....					–
,, 2....					–
,, 13....					–
,, 22....		–			
May 4....					+

May 23. *Post-mortem* 12 hours after death.

Rigor mortis present. The body is that of an oldish man, poorly nourished. Chest rigid and barrel shaped. Abdomen retracted. The





right eye is closed owing to swelling of upper eyelid. Superficial glands enlarged.

On opening the body in the usual way, the lungs overlapped the heart to a large extent. No free fluid in pleural or peritoneal cavities, and about ½ oz. in pericardium.

Heart.—Weight 8 oz., the right ventricle is soft and flabby and shows signs of atrophy of its substance, which in places is converted into a

brownish-yellow gelatinous tissue. The coronary arteries and branches are rigid and tortuous. Interior of heart looks normal. No petechiæ. Substance dark and firm.

Lungs.—Right weighs 12 oz., left 10 oz. Both are emphysematous, and there is marked congestion of the lower lobe of each lung.

Liver.—The surface is roughened, like early stage of a "hobnailed" liver. On section the substance is firm and feels uneven to the touch. Weight 3 lb.

Spleen.—Capsule smooth. Substance breaks down readily. Markedly pigmented. Weight 8 oz.

Kidneys.—Each weighs $3\frac{1}{2}$ oz. Congested. Capsule strips readily.

Pancreas.—Rather yellow in colour, otherwise healthy.

Mesenteric Glands.—Enlarged. Mesenteric and intestinal vessels congested and tortuous.

Brain.—On removing the dura mater the surface of the brain is seen to be covered with greenish pus (in the sub-arachnoid spaces). The convolutions are flattened and the sulci obliterated. On the upper surface of the cerebellum and the adjacent under surface of the cerebrum the sub-arachnoid pus is most abundant. On removing the brain from the body, a considerable quantity (? 2 oz.) of turbid fluid escaped from the brain and spinal canal. Cerebral substance softened. Lateral ventricle, aqueduct of Sylvius and fourth ventricle all considerably dilated. Vessels of circle of Willis rigid and patent.

Remarks.—For some time it was doubtful if this was a case of sleeping sickness, especially as it was only after repeated examination that the trypanosomes were found in the cerebro-spinal fluid. This case, like some of the others, ended in purulent meningitis.

Case 38.—Kitaroma (Male). Age 20 years. District, Bussi. Occupation, Fisherman.

March 25, 1903. Admitted to hospital. States that no friends had died of sleeping sickness, and that the illness began six months before admission, the first symptom being fever.

General Condition.—He is fairly well nourished. His gait weak and uncertain, intelligence fair, expression of face dull.

There is no œdema. The mucous membranes are normal in colour. No trophic changes. Lymphatic glands generally enlarged, to the size of beans in the groin. He complains of pain in the occipital region and back of the neck.

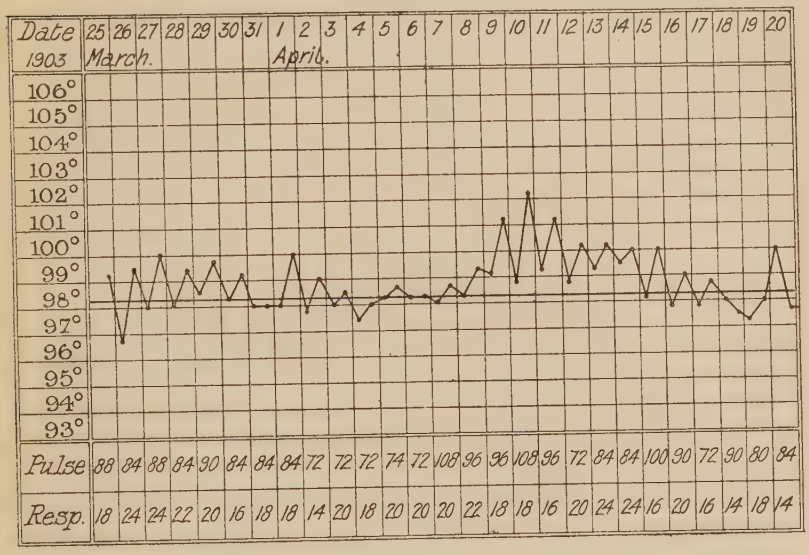
Nervous System.—His intelligence is fair, but he sleeps too much during the day. His speech is weak, indistinct and monotonous. Eyes normal. There is marked tremor of the tongue and some of the hands. Knee-jerk is present, ankle clonus absent.

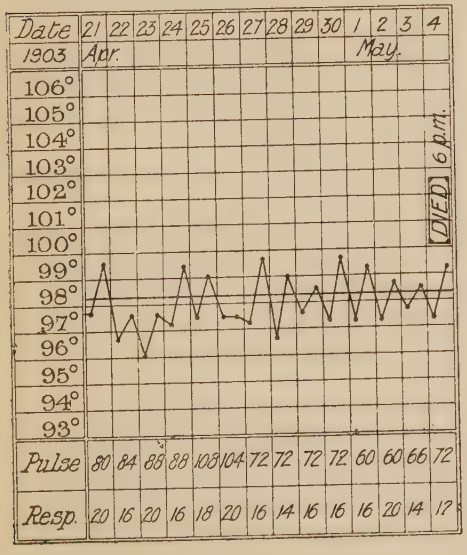
Alimentary System.—His appetite is good, tongue moist and furred. Liver and spleen are enlarged.

Circulatory System.—Heart sounds very weak, apex beat almost imperceptible and no bruit. Pulse 84 per minute lying down, weak, regular, low tension, easily compressible.

Skin.—Rather dry and scaly.

The following chart represents the course of the disease :—





The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid :—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Apr. 10	+		−		
„ 13					+
„ 20	+	−	−		
„ 22		−			
„ 27	+	−	+		

May 5. *Post-mortem* 20 hours after death.

A fairly well nourished young man about 20 years of age. Rigor mortis present. No bed sores. Superficial lymphatic glands enlarged.

On opening the body there is no fluid found in either the peritoneal or pleural cavities. There is ½ oz. of straw-coloured fluid in the pericardium.

Heart.—There is an excess of fat at the base and some deposit of black pigment under the pericardium. No petechiæ, outside or in. The muscular substance appears healthy, valves normal. Weight 10 oz.

Lungs.—Right weighs 15 oz. Some congestion of the upper lobe. The posterior part of the inferior lobe is deeply congested, although not actually consolidated. Left weighs 15 oz. Lower lobe deeply congested, upper lobe also, but to a less extent.

Spleen.—Weighs 12 oz. Capsule smooth. On section the tissue is tough, and there is an excess of fibrous tissue.

Liver.—Weight 3 lb. 3 oz. Adherent to the diaphragm about an inch from the anterior border. The falciform ligament was œdematous. The organ contains a large quantity of blood, it is highly congested, and probably there is some fatty degeneration.

Kidneys.—Each weighs 3½ oz. They are intensely congested, and deep dusky red in colour.

Mesenteric Glands.—Are somewhat enlarged (size of beans).

Brain.—The vessels are injected on the surface, and the convolutions are somewhat flattened, otherwise the appearances are fairly normal. On section the brain appears normal to the naked eye.

Remarks.—The accompanying photographs were taken on May 4. (See Plates 6 and 7.)

CASE 15.—Waiswa (Male). Age 10 years. District, Busoga (Wakelai).

March 25, 1903. Admitted to hospital. States that his illness began with headache about February 20.

April 7. He has a sad heavy look and cracked lips. Pulse 132.

April 18. *General Condition.*—He is well nourished and walks fairly well. His intelligence is fair, but he has a dull expression. There is no œdema. The lymphatic glands generally are enlarged. The pulse is 100 and fair. There are no cutaneous eruptions.

Nervous System.—He is always drowsy. The speech is not altered. The tongue is tremulous. Knee-jerk is present, ankle clonus absent.

Alimentary System.—His appetite is good, bowels regular, and no enlargement of liver or spleen.

Circulatory System.—Much exaggerated pulmonary second sound. Pulse a little irregular, tension fair, size fair.

Skin.—Normal.

May 6. Disease is in the late first stage.

May 13. During the past week the patient has rapidly got worse and now is unable to stand, evidently passing into the third stage. He sleeps practically all day.

May 16. This morning patient is unconscious and does not respond or appear to pay attention when spoken to. His head is drawn down to the right shoulder, and there are jerky twitchings of the arms.

May 18. Died at 10 P.M.

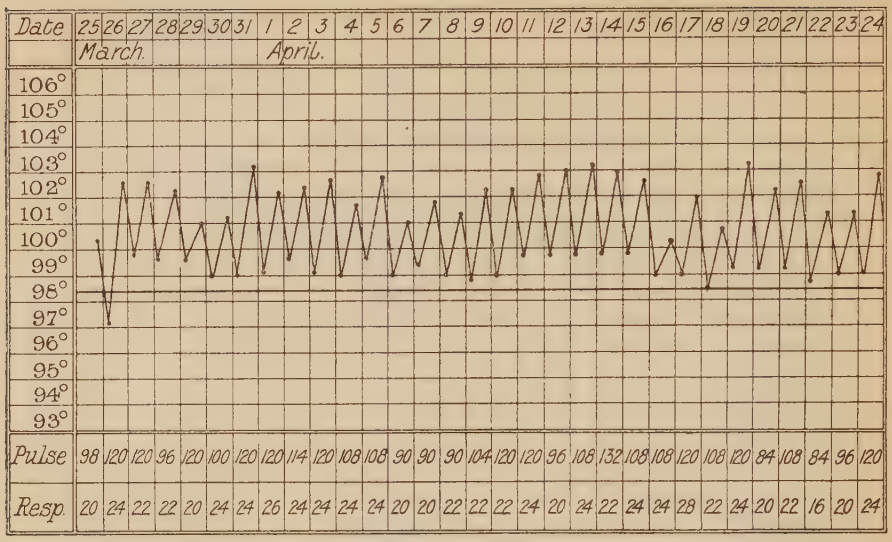
The following chart (p. 80) represents the course of the disease.

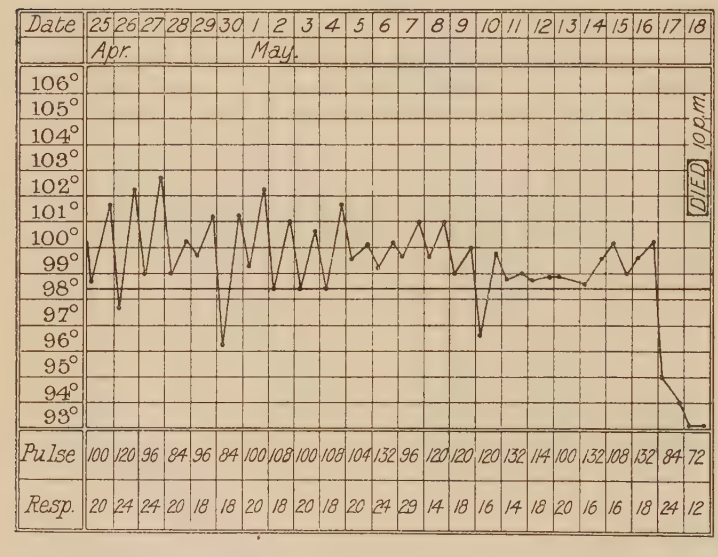
The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid :—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Mar. 29....					+
Apr. 18....	+		+		
,, 22....		−			
May 14....					+

May 19. *Post-mortem* 12 hours after death.

Rigor mortis is absent. The body is poorly nourished and there is marked retraction of the abdomen (as there was during life for the last few days). The superficial glands are only slightly enlarged. There are no bed sores.





The body was opened in the usual way. The peritoneal cavity contains no free fluid, nor is there any fluid in the pericardial or pleural cavities.

Heart.—Weighs 5½ oz. There is a small sub-pericardial ecchymosis on the left ventricle near the base. No petechiæ. The valves are healthy, and the muscle substance normal.

Lungs.—Each weighs 5 oz. Normal.

Liver.—Is smooth on the surface. On section it is slightly pigmented. The substance is very tough. Weight 11 lb. 14 oz.

Spleen.—Weighs 6½ oz. Is not adherent. Just about the middle of the external surface, under the capsule is a small hard tumour the size of a pea. Near the hilum is a similar hard tumour the size of a filbert nut. On section the tumours are red in colour, divided into loculi by trabeculæ of connective tissue, and are circumscribed, not invading the splenic pulp. Substance of spleen is tough and not obviously pigmented.

Kidneys.—Each weighs 2 oz. Normal.

Pancreas.—Is firm and deep yellow in colour.

Intestines.—Looked normal. *Mesenteric Glands.*—Are enlarged and some have hæmorrhages into them.

Brain.—On removing the dura mater the surface of the brain is seen to be deeply congested all over. There is slight excess of sub-arachnoid fluid, with ground-glass opacity, in the sulci. The convolutions are a little flattened. Nothing abnormal was found in the interior of the brain, except intense congestion of the choroid plexuses.

The ventricles did not contain any excess of fluid.

Remarks.—This is a typical case of sleeping sickness.

The accompanying photograph was taken on May 4, 1903. (See Plate 8.)

CASE 45.—Leobeni (Male). Age 25 years. District, Bussi.

March 26, 1903. Admitted to hospital. No information can be got from this man, as he cannot speak.

April 1. *General Condition.*—This man is well nourished, although so advanced in the disease that he can neither walk nor stand. The expression of his face is dull and vacant, and he fixes you with an expressionless stare. There is no œdema of any part. The colour of the mucous membrane is normal. There are no trophic changes. The lymphatic glands in the anterior triangle, the inguinal and femoral regions are slightly enlarged. There are no cutaneous eruptions, and the skin itself appears normal.

Nervous System.—It is difficult to say what amount of intelligence this man retains, as it is impossible to get him to answer questions. When asked anything he looks like a man just awakened from a sound sleep: he looks stupid and dazed, his eyes wander from face to face in a helpless, staring, wondering way. In regard to sleep, he is reported to sleep well at night, but not much during the day. His powers of speech have entirely disappeared, but when spoken to sharply he still is able to murmur indistinctly his name. His eyes are normal. There is extreme tremor of tongue, lips, hands, and

generally all over his body. He is still sensible to touch, and his muscle sense is fairly normal. Both knee-jerks are increased, the right more than the left, and ankle clonus is present in both ankles, also in the right more than the left.

Alimentary System.—He is still able to drink milk. His tongue is moist, furred, and extremely tremulous. Liver and spleen are not enlarged.

Circulatory System.—Heart. The apex beat can neither be seen nor felt. On auscultation the sounds of the heart are distant and weak, pulse 160, tension low, small in size, easily compressible and regular.

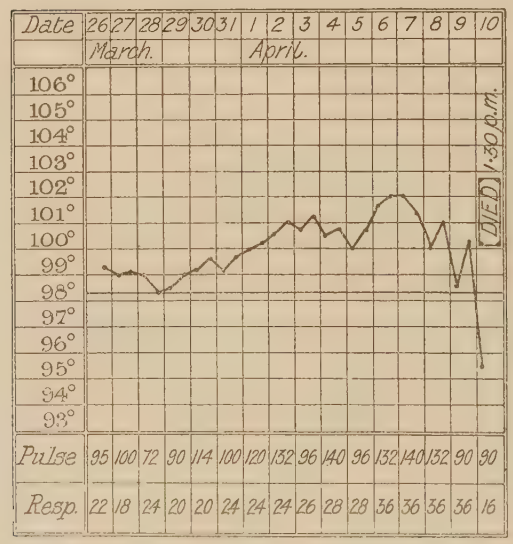
Respiratory System.—Nothing noteworthy.

Skin.—The skin appears normal, moist, and smooth.

Ophthalmoscopic Examination.—Left eye, slight blurring of disc. Right eye could not be seen.

April 10. Died 1.30 P.M.

The following chart represents the course of the disease :—



The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid :—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Mar. 28....					+
Apr. 1....				–	

April 10. *Post-mortem* immediately after death :—

The body is well nourished; there is a bed sore beginning on the right hip.

Brain.—On removing the calvarium the dura mater presents nothing noteworthy; but on removing that membrane the surface of the brain is found to be covered with a layer of greenish-coloured pus. This matter is contained in the sub-arachnoid spaces and is in excess of the normal sub-arachnoid fluid. The vessels on the surface of the brain are injected. On removing the brain the base is found to be in the same condition of purulent meningitis. The fluid in the ventricles is found to be cloudy. The substance of the brain is somewhat softened.

Cord.—The sub-arachnoid or cerebro-spinal fluid in the vertebral canal in the lumbar region was distinctly purulent.

Heart.—External fat, yellow in colour, is in excess. Muscular substance appears healthy. No petechiæ on inner surface. Valves healthy.

Lungs.—Right, healthy. Left, apex of lower lobe is consolidated, airless, and a greenish-yellow fluid is expressed on pressure. A piece floats in water. This patch of pneumonia is as large as a small orange.

Liver.—Large, dark in colour, gall bladder distended. On section dark, pigmented, and congested.

Spleen.—Enlarged, pigmented, congested, and friable.

Kidneys.—Capsule strips readily. Congested, otherwise healthy.

Remarks.—Noteworthy on account of the invasion of pneumococcus which probably gave rise to the meningitis.

This brain, like Kaperi's, is not at all typical (see Plate 9). We have not sent a drawing of an ordinary Sleeping Sickness brain, but shall do so.

A photograph of one is given on Plate 10.

Case 36.—Dikodemo. Male. Age 25 years.

Occupation, Teacher. Protestant School. District, Nkumba. Food, Fish, Bananas, and Sweet Potatoes.

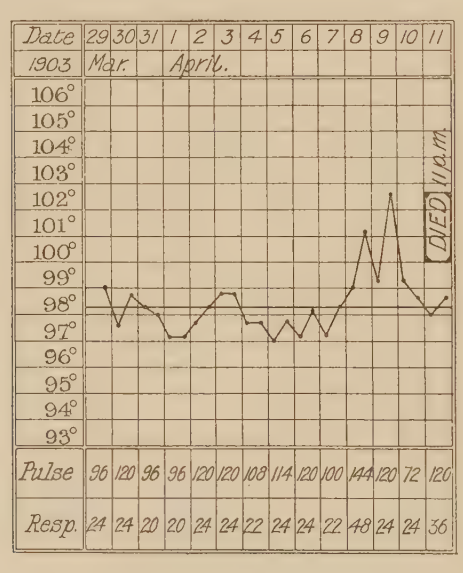
March 29, 1903. Admitted to hospital. Disease, sleeping sickness. States duration of illness about two months.

Present Condition.—Dikodemo is a man of good development and is well nourished. He stands with difficulty with feet apart and knees bent, balancing himself. When he walks his gait is weak, staggering, and uncertain. When asked to shut his eyes, his feet being together, he retains his balance. His facial expression is dazed, dull, wistful, and he stares vacantly now at one, now at another, with his eyes wide open and unblinking. It is difficult to get an answer from him.

There is no œdema or puffiness of any part. His mucous membrane is normal in colour. There are no trophic changes. The lymphatic glands in the occipital region, angle of jaw, and axilla are not enlarged, but in the anterior triangle of the neck and groin they are felt to be slightly enlarged, about the size of a small bean.

April 11. Died at 11 P.M.

The following chart represents the course of the disease :—



The following table shows the presence or absence of trypanosoma in the blood and cerebro-spinal fluid :—

Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Apr. 3....	+	−	−	−	+
„ 7....			−		
„ 12....					−P.M.

April 12. *Post-mortem* 12 hours after death.

The body is that of a well-nourished man of middle height and apparently about 25 years of age. Rigor mortis is present. There are no bed sores.

Brain.—On removing the calvarium the dura mater appears healthy. The surface of the brain has an excess of fluid, the vessels are injected, especially on the left side. The sub-arachnoid fluid is fairly clear, but in some of the sulci it has an opaque ground-glass appearance. The lateral ventricles contain an excess of fluid of a slightly cloudy character. The substance of the brain is not softened, and nothing further abnormal was noted.

Heart.—Healthy.

Spleen.—Slightly enlarged and tougher than normal.

Liver.—Pigmented. *Kidneys.*—Healthy.

Lungs.—There is some congestion at the base of the left lung. Purulent fluid extrudes from the small bronchi on pressure.

Remarks.—This is a typical case of sleeping sickness. It is to be noted that the trypanosoma is not found in the cerebro-spinal fluid taken twelve hours after death.

The trypanosomes seem to disappear from the body fluids soon after death.

CASE 42.—Katola (Male). Age 25 years. District, Bussi. Occupation, Charcoal Burner. Food, Sweet Potatoes.

March 25, 1903. Admitted to hospital. He states that none of his family have died of sleeping sickness, nor have any other cases occurred in his house. He also states that he was taken ill 3 months before admission to hospital, and that his first symptom was fever.

April 6. He is thin. He walks fairly. Speaks well, but has tremor of tongue and hands. Pulse 140.

April 29. *General Condition.*—This man is badly nourished, his ribs are all showing. He is not confined to bed, and walks fairly well. His intelligence is fair, but the expression of his face is somewhat dull and

heavy. His lymphatic glands are enlarged to the size of pigeon's eggs in the femoral region, and that of beans at the angle of the jaw.

Nervous System.—He is fairly intelligent and his memory is normal. He is reported not to sleep excessively during the day. His speech is weak, but distinct. There are tremors of the tongue and hands. The knee-jerks are present, and ankle clonus absent.

Alimentary System.—His appetite is good. His tongue moist and furred. His liver is not enlarged, but his spleen is palpable.

Circulatory System.—The impulse of the heart is seen and felt in the fifth space. There is an apical systolic murmur, and also a localised presystolic murmur near the ensiform cartilage. Pulse 112, size fair, regular.

May 6. During the last few days this patient has become much more feeble and can hardly walk a few paces without clinging to something for support. Tremor of tongue and fingers very marked.

May 13. No change in condition.

May 15. About 50 c.c. of cerebro-spinal fluid obtained by lumbar puncture. Specific gravity 1002.

May 20. Patient is passing into the third stage.

May 28. Died at 11 P.M.

The following chart (p. 87) represents the course of the disease.

The following table shows the presence or absence of trypanosomes :—

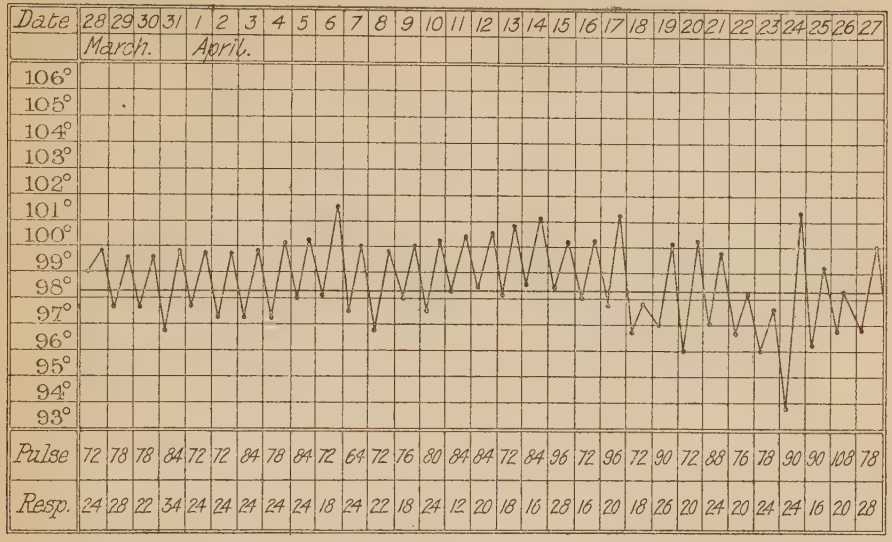
Date.	Parasites in blood.			Parasites in C. S. fluid.	
	Filaria.	Malaria.	Trypanosoma.	Filaria.	Trypanosoma.
1903.					
Apr. 6....					+
„ 19....		−			
„ 22....	+	−	+		
May 15....					+

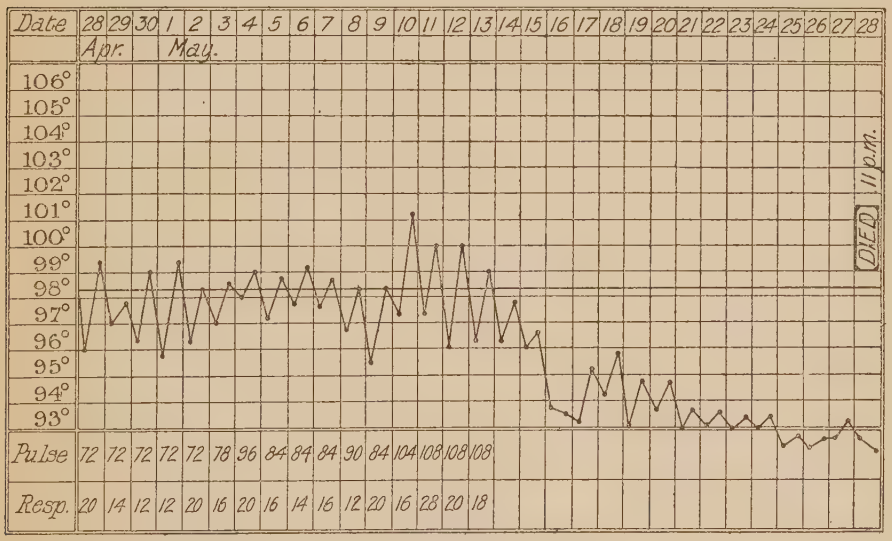
May 29. *Post-mortem*, 10 A.M., 11 hours after death.

The body is that of a fairly well nourished man. There are no cutaneous eruptions, and no bed sores. Rigor mortis passing off. Slight enlargement of superficial lymphatic glands.

On opening the body in the usual way, no fluid was found in the pleural, pericardial, or peritoneal cavities.

Heart.—Weighs 8 oz. There are no petechiæ on the surface of the interior, no disease of orifices or valves, and the muscular substance looks healthy.





Lungs.—Left. Adherent to parietes, especially towards the base. Weighs 10 oz. Base somewhat congested. Glands markedly enlarged.

Right. Adherent at apex and towards base. Weighs 10 oz. Both lobes are healthy.

Liver.—Adherent to diaphragm on the right side, old perihepatitis. The left lobe is adherent to the spleen. Weighs 3 lb. 8 oz. It is somewhat congested, otherwise normal. Not abnormally tough or fibrous.

Spleen.—Generally adherent to diaphragm, also to liver. Considerably enlarged. Weighs 1½ lb. On section looks dark and breaks down readily under the finger.

Kidneys.—Each weighs 4 oz. Capsules strip off readily. Healthy on section. *Pancreas.*—Firm, yellow in colour.

Intestines.—Look normal externally. *Mesenteric Glands.*—Slightly enlarged.

Brain.—Dura mater not adherent. Convolutions flattened. Marked injection of vessels of pia mater. No marked increase of sub-arachnoid fluid. The lateral ventricles are dilated. Fourth ventricle not dilated. Brain otherwise normal, except for some hæmorrhages in the caudate nucleus of both hemispheres. *Vide* photograph, Plate 10.

Remarks.—10 c.c. of cerebro-spinal fluid was taken 11 hours after death and centrifuged. No living trypanosomes were found.

Fig. 1. x 2000

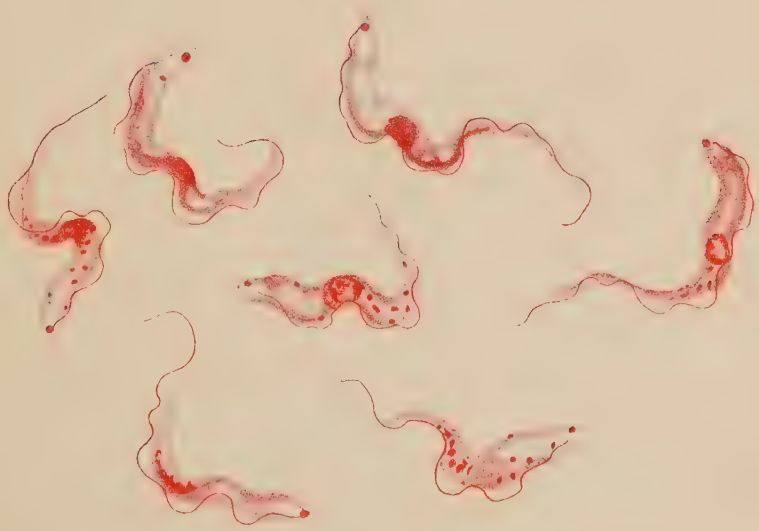


Fig. 2. x 2000.

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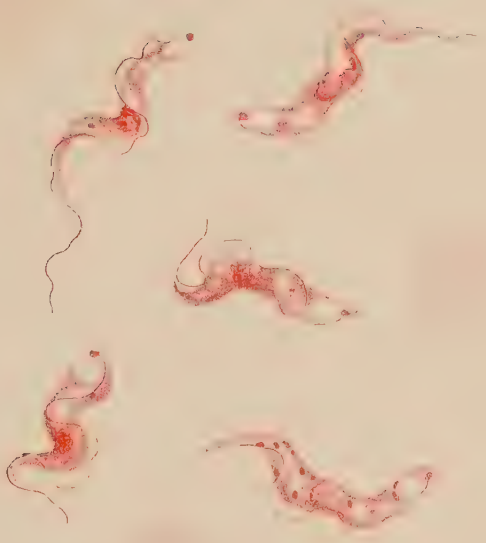

Fig. 3. x 2000

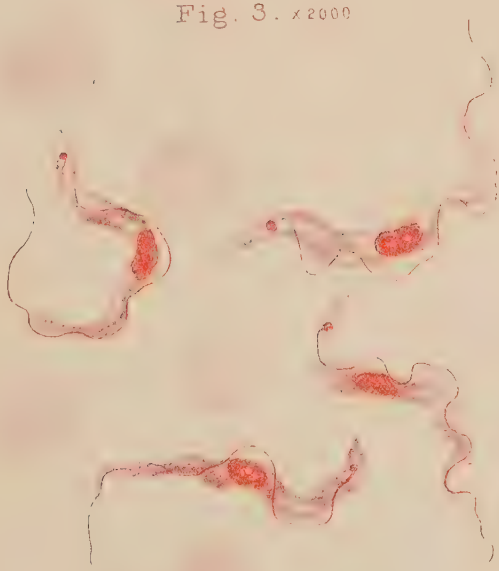

Fig. 4. x 2000.

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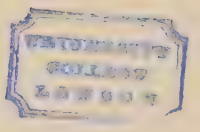

(see p. 25.)

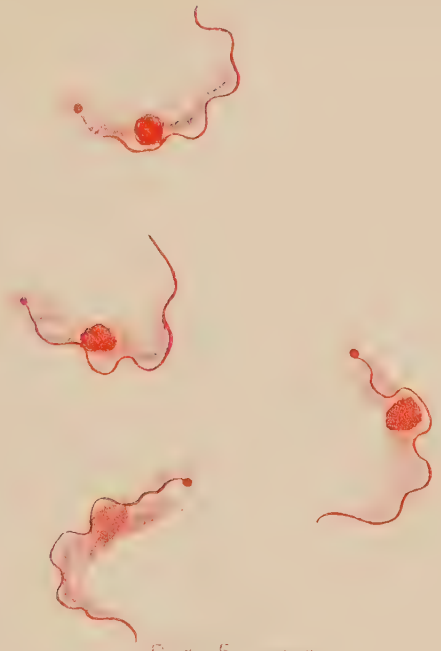

Fig. 5. x2000.

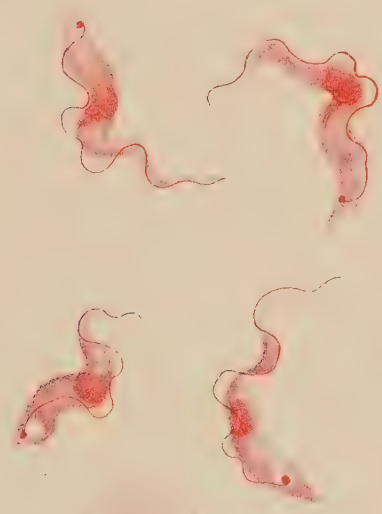

Fig. 6. x2000.

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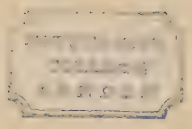
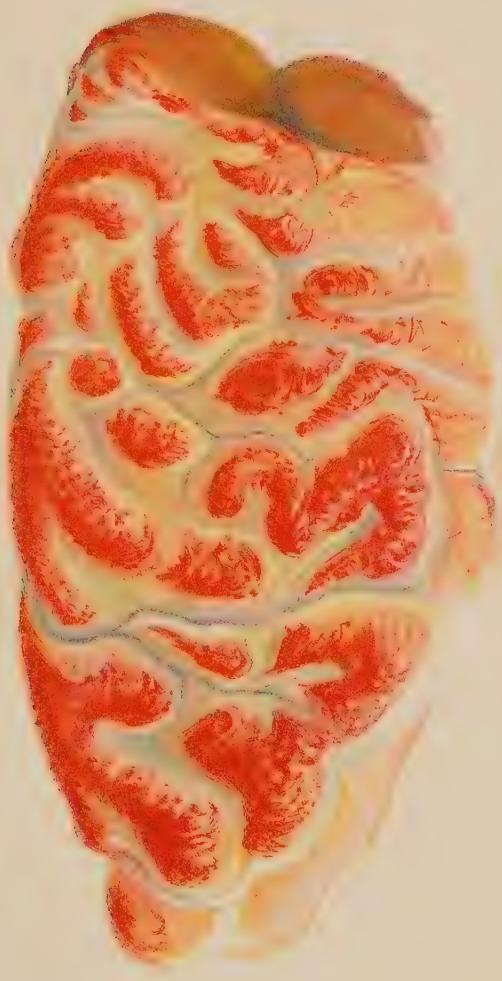
Figs. 7 and 8.—MONKEYS USED IN EXPERIMENTS.



(see p. 42.)



M.F.B. del. Huth lith. et imp

SURFACE OF BRAIN
CASE 4. KAPERI.

CASE 38. KITAROMA.

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Case 38. Kitaroma.

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CASE 15. WAISWA.

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SURFACE OF BRAIN.
CASE 25, LEOBENI.

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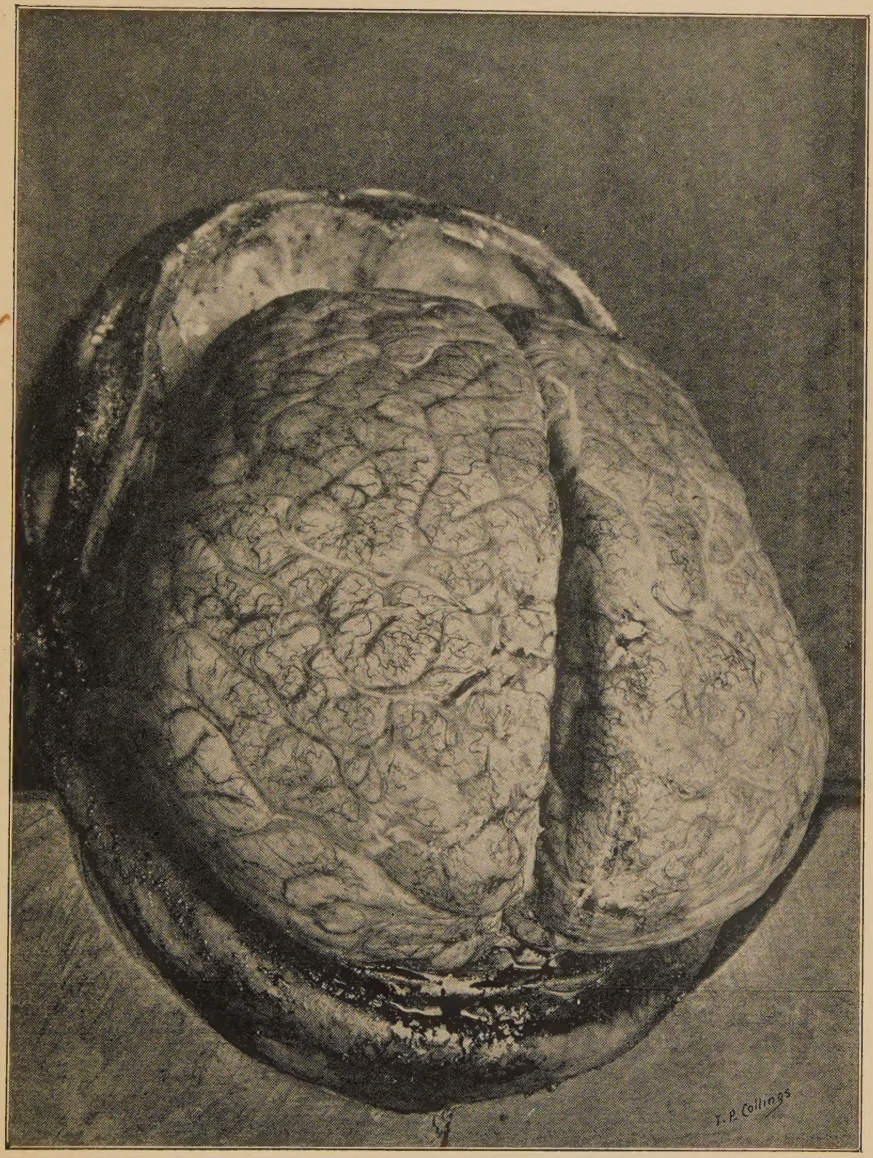

PHOTOGRAPH OF BRAIN. CASE 42. KATOLA. SHOWING FLATTENING OF CONVOLUTIONS AND INJECTION OF VESSELS.

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